Versar INC.

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EXISTING CONDITIONS INVESTIGATION AND PROPOSED MODIFICATIONS TO LANDFILL COVER SYSTEM SUPPLY SIDE LANDFILL NAVAL STATION GREAT LAKES, ILLINOIS

Prepared for:

Department of the Navy
Naval Station Great Lakes
Environmental Department
201 Decatur Avenue
Great Lakes, IL 60088-5600

Versar Job No.110684.0003.001

August 2003

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This document has been prepared in accordance with accepted scientific and engineering practices/procedures and the Versar, Inc. Quality Assurance Program.

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ACRONYMS USED IN THIS REPORT

ASTM	American Society for Testing and Materials
bgs	below ground surface
CQA	Construction Quality Assurance
IEPA	Illinois Environmental Protection Agency
ESDD	East Skokie Drainage District
ET	Evapotranspiration
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
HDPE	High density polyethylene
FOIA	Freedom of Information Act
HELP	Hydrologic Evaluation of Landfill Performance
LL	Liquid Limit
MSL	Mean Sea Level
MWR	Morale, Welfare and Recreation
NSGL	Naval Station Great Lakes
O&M	Operations and Maintenance
PI	Plasticity Index
PID	Photoionization Detector
PL	Plastic Limit
PVC	Polyvinyl chloride
USCS	Unified Soil Classification System
SMC	Lake County Stormwater Management Commission
SSL	Supply Side Landfill
TACO	*Tiered Approach to Corrective Action Objectives* (35 IAC 742)
TMW	Temporary Monitoring Well
USEPA	United States Environmental Protection Agency
VOC	volatile organic compound

EXECUTIVE SUMMARY

Project Scope

This report presents the results of various site investigation activites conducted at the Supply Side Landfill (SSL or Site) conducted by Versar, Inc. at Naval Station Great Lakes (NSGL) to document existing conditions of SSL. This report also presents recommendations to modify the existing landfill cover system to achieve regulatory compliance and promote reuse of the Site by the Navy, a discussion of permit requirements, construction specifications and quality assurance requirements, and operations and maintenance requirements. This report is accompanied by detailed plans for construction of the modified landfill cover system.

An aerial survey was conducted to establish current topography of the main landfill as well as a fill area north of the main landfill referred to as the "Panhandle Area". A digital topographic map was generated to serve as the base map for all other SSL maps and design drawings.

Existing Site conditions were investigated by drilling and sampling 33 soil borings in and around the landfill. Soil borings advanced inside the landfill were conducted to establish the existing soil cover thickness and depth to waste. Soil borings ranged in depth from 8 feet bgs to a maximum depth of 20 feet bgs. Select soil samples were tested to determine Atterberg limits, moisture content, soil classification, and hydraulic conductivity.

Five temporary monitoring wells (TMW1 through TMW5) were installed during investigation activities to determine the depth to leachate and conduct leachate sampling and analysis to characterize the leachate within the landfill. Leachate samples were analyzed for indicator parameters used during the quarterly groundwater monitoring program, and TMW1 was analyzed for volatile organic compounds (VOCs).

Landfill gas screening was conducted at 23 locations to determine landfill gas concentrations and pressures below the landfill cover and another 10 locations outside the recognized area of the

landfill. The landfill gas screening was conducted in conjunction with soil borings drilled as part of the landfill cover thickness evaluation. Attempts were also made to obtain landfill gas readings from existing gas vents located across the landfill.

Summary

Field investigation activities verified that a suspected area located northeast of the main landfill contained buried refuse (this area was identified as the "Panhandle Area"). It is recommended that waste/refuse in the Panhandle Area be exhumed and consolidated with the main landfill.

In order to optimize end use possibilities, it is recommended that the existing landfill surface be regraded to create a flat plane surface with a gradual slope from west to east across the top of the landfill. A 3 percent slope is designed for the top surface of the landfill for drainage and erosion protection. Regrading operations shall not cut into existing waste in the main landfill, except as may be necessary around the perimeter of the landfill to key the final cover into the native clay soils of the project area. Excavated waste materials shall be placed on the lowest areas of the existing landfill and under the new final cover system.

Final cover design is based on proposed end use for the Supply Side Landfill Site, available cover materials, material grading and placement costs, and schedule. Consistent with standard practices and engineering standards, the final cover should consist of 18 inches of low permeability clay with 6 inches of topsoil to promote vegetation. The final cover will be increased to 24 inches of low permeability clay with 6 inches of topsoil around the perimeter of the landfill where the slopes key into the existing ground surface to help protect against erosion. A geotechnical investigation has determined the proposed borrow materials near the Site are suitable as low permeability soil for the modified cover system.

Based on the field investigation and general site observations, the existing methane gas vent system has limited effectiveness since many of the vents do not appear to extend through the existing cover system into the underlying waste. In addition, the existing vent system is obtrusive and inconsistent

with proposed end use. It is recommended the existing gas vents be removed (or cut back below grade) and a new passive methane gas venting system be designed to remove landfill gas passively from the main landfill area. The new passive gas venting system will consist of shallow trenches excavated within the waste material, with horizontal collector pipes in granular bedding leading to passive vents. A minimum number of vents will protrude through the ground surface and be located along a roadway on the west side of the landfill.

Section 7 presents Construction Plans and Specifications for the proposed landfill cover system modifications. Section 8 presents an Operations and Maintenance Plan for the modified cover system. Section 9 presents a construction cost estimate and schedule to implement the proposed landfill cover system modifications.

1.0 INTRODUCTION

1.1 Purpose

This report presents the results of various site investigation activites conducted by Versar, Inc. at the Supply Side Landfill (SSL or Site), Naval Station Great Lakes (NSGL) to document existing conditions of SSL. This report also presents recommendations to modify the existing landfill cover system to achieve regulatory compliance for reuse of the Site by the Navy, a discussion of permit requirements, construction specifications and quality assurance requirements, and operations and maintenance requirements. This report is accompanied by detailed plans for construction of the modified landfill cover system.

This report is prepared in accordance with the with the requirements outlined in the Revised Statement of Work, Supply Side Landfill Cover Study, NTC Great Lakes (SOW), dated 4 September 2002 and Versar's Proposal No. Q02-5059, dated September 13, 2002, as approved by NSGL on September 24, 2002. Versar was assisted on this project by Earth Tech, which prepared the design drawings, material and construction specifications, operations and maintenance plan, and other associated plans.

The scope of the Site investigation was expanded to include: (1) the area between Building 3503 and Skokie River (referred to as the "Panhandle Area", located northeast of the main landfill); (2) provide for additional subsurface efforts due to the existing cover system being substantially thicker than originally anticipated; and (3) geotechnical evaluation of the proposed cover materials. The expanded scope of the Site investigation and additional drilling efforts were conducted in accordance with Versar Proposal No. Q03-5153, dated December 4, 2002, as approved by NSGL on January 14, 2003. The geotechnical evaluation of the proposed cover materials was conducted in accordance with Versar Proposal No. Q03-5188, dated January 24, 2003, and approved by NSGL on February 5, 2003.

1.2 Site Background Information

1.2.1 Site Description

SSL is located on NSGL in the Northeast 1/4 of Section 18, Township 44 North, Range 12 East, Shields Township, Lake County on the United States Geological Survey (USGS) *Waukegan, Illinois* 7.5-minute topographic map (USGS, 1993). Drawing 1, Cover Sheet presents a vicinity map which depicts the Site location with respect to NGSL and the surrounding area.

SSL was designed as a trench and fill landfill. The north portion was filled first, and then the southeast portion (i.e., south east of the former rail spur) was designated as landfill expansion (U.S. Navy, undated). The southeast portion and part of the north portion were built on an existing lagoons and filter beds (presumably used for wastewater treatment).

SSL received waste approximately from 1969 to 1983. Waste reportedly consisted of primarily mixed office waste and some food waste (Rogers, et. al., 1986); although, residential waste and construction/demolition debris was also reportedly disposed (K-Plus, 1995a).

In 1985, the Naval Construction Battalion graded the final cover (Rogers, et. al., 1986). The landfill was described as two cells separated by an inactive railroad spur bending southeast through the Site. In 1999, the NSGL removed the railroad track ties. In 2001, NGSL filled the valley depression with imported soil, creating a smooth contiguous cover between the two cells. The soil fill was also placed on top of the main landfill to provide additional cover protection.

According to NSGL Environmental Department, a landfill waste boundary delineation has not been conducted. Versar used an existing report (STS, 1983) to determine the approximate landfill boundary, as shown on Drawing 1. The landfill is bounded by high-voltage transmission lines over railroad right-of-way to the west, road and warehouses to the north, Skokie River to the east, and a small drainage ditch to the south. A 14-inch underground water main is located east of the buried rail spur along the north part of the main landfill. The Site is enclosed by 6-foot high chain link

fence along the north, west and south perimeter. The Panhandle Area is bounded by a fence along the west, south and north and by Skokie River along the east side. Skokie River bounds the east side of both the main landfill and Panhandle Area.

The area surrounding the Site is mixed residential, commercial, and industrial. Vacant land and large warehouses exist to the north, a residential trailer park is located east across Skokie River, a former wastewater treatment plant is located to the south (currently operated as wastewater overflow detention area), with wetlands, railroad tracks and industrial properties located to the west.

Site elevations range from 677 to 698 feet above Mean Sea Level (MSL). The Site currently drains via sheet flow in all directions. Skokie River runs adjacent to SSL and flows south. Based on groundwater level data taken from landfill monitoring wells in September 1998, groundwater flow direction is to the southeast (Toltest, 1999).

Review of published geologic information indicates NSGL is underlain by glacial till ranging in thickness from approximately 170 to 210 feet, below which is bedrock (limestone). The till consists of predominantly clayey soil with thin, irregular, discontinuous lenses of sand and silty sand. Discontinuous lenses of sand are a potential source of groundwater. Two discontinuous groundwater zones were reported at various NSGL locations at depths of 10 and 15 to 30 feet below ground surface (bgs) (Halliburton NUS, 1992).

1.2.2 Summary of Previous Reports and Findings

Versar reviewed NSGL files and files and documents obtained from the Illinois Environmental Protection Agency (IEPA) through the Freedom of Information Act (FOIA). Versar submitted a FOIA Request to IEPA on October 14, 2002 for file and permit information for Supply Side Landfill (U.S. Naval Training #2 Landfill No. 0978110002). IEPA letter dated November 6, 2002 provided copies of the public record totaling 540 pages of paper and 22 microfilm jackets. Versar reviewed this information to gain a further understanding of history and regulatory activities associated with SSL.

Following is a summary of major documents reviewed and significant findings:

Final Report for Technical Services Being Provided to Develop a Closure Plan (STS, 1983) documents a subsurface investigation, and recommendations for landfill closure. The closure plan addressed landfill cover requirements, groundwater and gas migration controls, and included material specifications for closure.

According to the reviewed documents, the STS Closure Plan was apparently implemented, and closure activities were completed as of July 23, 1985.

On December 20, 1988 the IEPA issued a letter to the Navy stating Certification of Closure requirements had been met in accordance with Title 35 of the Illinois Administrative Code (35 IAC) Subpart G, Section 807.508. The IEPA letter stated the facility must continue to comply with post-closure plan requirements for 5 years following closure.

Technical Memorandum - Immediate Response Action (SEC/Donohue, 1992), was prepared to determine possible immediate health and safety issues, and make recommendations for corrective action. The report stated several observations regarding the condition of SSL including deterioration of the landfill cap and presence of leachate seeps. The report concluded high water levels have rendered gas vents ineffective, the existing capping system was inadequate, and high leachate head may result in seepage to surrounding groundwater.

Supplyside Landfill Investigation Work Plan (Halliburton NUS, 1992) proposed leachate sampling, gas sampling, landfill cover thickness evaluation, and geotechnical testing. There is no record that the work commenced.

Landfill Assessment Report (K-Plus Environmental, 1995a) was prepared to identify environmental concerns related to SSL. The report recommended installation of new monitoring wells, and suggested an area north of the landfill as a possible filled area and possible source of leachate to Skokie River.

Landfill Cover Specifications (K-Plus Environmental, 1995b) were prepared as part of the proposed cover repairs. These repairs were not implemented.

Delivery Order Completion Report (Toltest, 1999) was prepared to document installation of new monitoring wells (MW-A through MW-F), repair of gas vents, and other landfill maintenance activities.

Plan of Action - Repairs to Supply Side Landfill and Forrestal Landfill (Toltest, 2000) was prepared to scope out repair work, including regrading a soil stockpile at SSL to fill in the old railroad track depression, and re-seeding bare soil areas.

(According to NSGL Environmental Department, additional soil was added to fill the old railroad track depression and across the top plateau of the landfill in 2001).

Delivery Order Completion Report - Sampling and Analysis of Volatile Organic Compounds at Supply Side Landfill (Toltest, 2001) documented collection and analysis of soil gas samples from 40 points. The report concluded that methane gas readings were variable across the landfill and that VOCs were present in subsurface although low in concentration, and that shallow groundwater and methane was observed in the "Panhandle" area north of the main landfill.

1.2.3 Regulatory History

Versar's review of NSGL files and IEPA files obtained through FOIA revealed no correspondence referring to a permit; however, the files received from the NSGL contained the following documents and correspondence regarding SSL regulatory closure activities:

- A closure plan was developed by STS Consultants, Ltd., titled "Final Report for the Technical Services Being Provided to Develop a Closure Plan for the Naval Base" (STS, 1983).

- On September 9, 1983 the IEPA issued a letter to the Navy approving the STS closure plan.
- On December 9, 1987 the IEPA issued a letter to the Navy requiring landfill closure certification.
- On October 11, 1988 the Navy issued a letter to IEPA documenting closure activities completed as of July 23, 1985.
- On December 20, 1988 the IEPA issued a letter to the Navy stating Certification of Closure requirements had been met in accordance with 35 IAC Subpart G, Section 807.508, and that the facility must continue to comply with post-closure plan requirements for 5 years following closure.

On April 11, 2003 a meeting was held between representatives of NSGL Environmental Department, Versar, and IEPA to discuss the regulatory status of SSL. During the meeting it was determined that the landfill is not a permitted facility by the IEPA. The IEPA subsequently stated landfill cover modification, Panhandle excavation activities, and final closure shall be coordinated under the IEPA Federal Facilities program.

2.0 FIELD INVESTIGATION ACTIVITIES

2.1 General

The scope of the SSL field investigation included both land and aerial surveying, soil borings and grid-based sampling to obtain existing soil cover thickness and soil gas measurements, geotechnical analysis of existing cover, installation of temporary monitoring wells, and sampling and analysis to determine depth and chemical make-up of leachate. Field investigation activities are summarized in Table 1. The original scope was expanded to: (1) include the area between Building 3503 and Skokie River (referred to as the "Panhandle Area", located northeast of the main landfill) because it was suspected as containing waste and (2) add depth to soil borings because the existing cover of the main landfill was substantially thicker than originally anticipated.

Existing Site conditions were investigated by drilling and sampling 33 soil borings in and around the landfill, conducting geotechnical testing on the existing landfill cover materials, installing five temporary monitoring wells within the landfill, collecting leachate/groundwater samples from the temporary wells, and analyzing leachate/groundwater samples for contaminants of concern.

2.2 Aerial Survey

An aerial survey was conducted to establish current topography of the main landfill as well as the Panhandle Area. The aerial survey was obtained from an elevation of 1,800 feet on November 23, 2002. Versar subcontracted the services of Chicago Aerial Survey to conduct the aerial survey of SSL and vicinity.

Vertical black and white aerial photography was acquired to produce a topographic contour map with a vertical accuracy of a two feet. Horizontal and vertical field control was performed using convention land surveying techniques to tie in the aerial survey. Horizontal control was relative to North American Datum as updated ((NAD) 83 (1997) Illinois State Plane Coordinates - East Zone), and vertical control was relative to North American Vertical Datum (NAVD) 1988. A digital

topographic map was generated to serve as the base map for all other SSL maps and design drawings.

2.3 Soil Borings

Grid-based sampling was conducted to establish the existing soil cover thickness and depth to waste. Soil borings GP-1 through GP-23 were advanced using truck-mounted Geoprobe™ (direct push technology) equipment was used to minimize generation of investigative-derived waste and expedite the drilling process.

Prior to the start of field exploration activities, the landfill was divided into approximately one acre grids. Exploratory soil borings were drilled at a frequency of one per acre. Soil borings ranged in depth from 8 feet bgs to a maximum depth of 20 feet bgs. Soil boring locations are shown on Drawing 2 (see Section 7.1). In general, soil borings were continuously sampled until waste/refuse was encountered. Upon completion, borings were converted to temporary groundwater monitoring wells or abandoned by filling with bentonite grout.

Versar's field geologist logged all borings and obtained representative undisturbed and bulk samples of the subsurface materials encountered. The soils were classified in accordance with the Unified Soil Classification System (USCS), as described in the American Society for Testing and Materials (ASTM) D-2487 Test Procedure, Classification of Soils for Engineering Purposes. The Boring Logs are presented in Appendix A. Versar subcontracted the services of Mid-America Drilling to advance soil borings and install gas probes.

2.4 Temporary Monitoring Wells

Five temporary monitoring wells (TMW1 through TMW5) were installed during investigation activities for the landfill cover evaluation. Temporary monitoring wells (TMWs) were installed to determine the depth to leachate and conducted leachate sampling and analysis to characterize the leachate within the landfill. TMW locations are shown on Drawing 2 (see Section 7.1).

TMWs were constructed by inserting the well casing into the annular space of the hollow-stem auger prior to auger removal. Each well consisted of 2-inch I.D. PVC materials utilizing 10-foot section of 10-slot (0.01" opening) PVC machine-slotted screen and PVC riser centered within the annular space of the boring. The screen and riser material have threaded, flush-joint fittings (ASTM F480). The top of the well screen was positioned just above the interface between the waste/refuse and the underlying native clay soils, and was sealed at the bottom with a threaded flush-joint cap.

Filter packs were installed around the well screens consisting of clean, uniform, siliceous sand (#5 filter sand). The filter pack extended from the bottom of the well screen to approximately 1.5-feet above the screened interval. The remaining portion of the annular space was filled to grade with bentonite pellets. The top of the well casing was capped with a well plug to protect the integrity of the well. Construction of TMWs was supervised by Versar's field geologist.

TMWs were developed by bailing to remove materials introduced into the well during construction and insure properly functioning. TMWs 1 and 2 were developed by removing leachate from each well until they became dry. TMWs 3 and 4 were developed by removing approximately 40 gallons of groundwater from each well. TMW5 was developed by removing approximately 40 gallons of leachate from the well. Purge water was placed into 55-gallon drums. Top of casing elevation and vertical coordinates were tied to the topographic survey by Jacob and Hefner Associates using conventional land surveying equipment.

Temporary monitoring wells were abandoned by removing casing to two feet below ground surface, filling the remaining casing with bentonite, and filling the top of the open borehole with bentonite on February 6, 2003.

2.5 Geotechnical Sampling and Testing

Geotechnical samples were collected from the cover materials during the cover thickness investigation. A total of 28 soil samples were collected for possible geotechnical testing. Geotechnical sample depths ranged from 1 to 8 feet, depending on the thickness of cover. Soil

samples were collected in clear acetate liners using a Geoprobe®. Soil samples were inspected in the field for soil staining, discoloration and odors, and were logged by Versar's field geologist.

Representative samples were retained from the landfill cover materials, and where different soil layers were encountered. No samples were collected from the top foot of loose sandy/clayey material and/or topsoil for the geotechnical evaluation of the landfill cover soils. Selected samples were analyzed for geotechnical parameters. One sample was collected from the native clay below the landfill at a depth of 30 feet (bgs).

The laboratory testing program consisted of Atterberg limits, moisture content, soil classification, and hydraulic conductivity performed on selected samples. Geotechnical test results are discussed in Section 3.2, and included on soil boring logs in Appendix A.

2.6 Leachate Head Measurements and Sampling

Water levels were allowed to stabilize for a minimum of 24 hours, then leachate or groundwater level measurements were conducted using an electronic water level indicator. Each well was carefully opened to release any gas pressure and the top of the well was screened for organics using a PID. Water levels were measured on two occassions, November 25, 2002 and December 13, 2002.

On November 25, 2002 leachate samples were collected from each TMW. Leachate samples were analyzed for the following landfill indicator parameters used during the quarterly groundwater monitoring program: pH, phenols, total organic carbon, ammonia, chloride, sulfate, total dissolved solids, iron, manganese, and lead. In addition, TMW1 was analyzed for VOCs, since this boring exhibited the highest PID readings. Liquid samples were collected into laboratory-supplied, clean, pre-preserved sampling containers, and placed on ice. Sample results for the leachate evaluation are discussed in Section 3.3.

2.7 Landfill Gas Sampling

Landfill gas screening was conducted at 23 locations to determine landfill gas concentrations and pressures below the landfill cover. Landfill gas measurement were obtained at GP-1 through GP-8, and GP-11 through GP-23 within the main landfill, GP-9 and 10 in the Panhandle Area, and another 10 locations (GP-24 through GP-33) outside the recognized area of the landfill. The landfill gas screening was conducted in conjunction with soil borings drilled as part of the landfill cover thickness evaluation.

A gas probe was inserted and sealed into the completed borehole, and landfill gas measurements were conducted (pressure and concentration). Soil gas samples were collected using a post-run-tubing system (sample drawn through point and into sample tubing). Sample tubing was connected to GA-90 Infrared Gas Analyzer (and sample pump). Each sample was analyzed for methane, carbon dioxide, and oxygen, and static pressure.

In addition, Versar attempted to obtain landfill gas readings from existing gas vents located across the landfill. Gas measurements were obtained by inserting a length of tubing past the top elbow of the vent (to minimize ambient air intrusion), which was connected to the GA-90. Seventeen of the 24 vents were tested; the remaining vents were inaccessible due to their height. Sample results for the gas probe and gas vent testing is discussed in Section 3.4.

3.0 INVESTIGATION RESULTS

3.1 Existing Conditions and Cover Thickness

Soil borings encountered cover material ranging from 2 to 12 feet thick. Cover material primarily consisted of silty clay soils with varying amounts of gravel. The existing top of waste was mapped from the field investigation data, and is shown on Drawing 3 (see Section 7.1). Cover thickness/top of waste data and observations are shown in Table 2. Existing cover thickness was interpreted from the field investigation data and is shown as an isopach on Drawing 4 (see Section 7.1).

Most borings encountered several layers of daily cover separated by refuse or refuse mixed with the soil. At some locations, primarily in the east part of the landfill, crushed limestone was interbedded with silty clay. Site reconnaissance indicated the presence of occasional construction demolition debris at the ground surface in the southeast part of SSL. Refuse was also encountered at the surface in the Panhandle Area where there was little or no cover material. Specific soil conditions are depicted on the boring logs in Appendix A.

The southern part of the landfill is characterized primarily by construction debris (fill soils interlayered with broken concrete, brick, etc.). Construction rubble was encountered in southern part of landfill in borings GP19, GP20, GP32, and GP33. Industrial grit material was observed in borings GP31, GP33, and MW3. The industrial grit may have been associated with the filter bed as shown in Navy Public Works Sanitary Landfill construction drawing for SSL (U.S. Navy, undated).

The bottom of the landfill (native gray silty clay) was encountered 30 feet bgs at TMW2 (or approximately elevation 659 feet msl). This is consistent with investigation findings of others which reported waste as deep as 19 feet bgs (approximately elevation 654). The bottom of the landfill in the Panhandle Area was 12 feet bgs (approximately elevation 665).

Pockets of trapped (or perched) water and saturated conditions were encountered at various depths within the landfill,as discussed in Section 3.3.

3.2 Geotechnical Analysis

The laboratory testing program consisted of moisture content, Atterberg limits, soil classification, and flexible wall permeability testing (hydraulic conductivity). All tests except hydraulic conductivity were performed on bulk disturbed samples. The hydraulic conductivity test was performed on undisturbed shelby tube samples. Geotechnical testing results are summarized in Table 3. Complete geotechnical test reports are provided in Appendix B.

Geotechnical testing of the existing cover materials indicates those materials meet the original material specifications in the implemented Closure Plan (STS, 1983) and constitute an adequate cover over the entire main landfill area. Laboratory permeabilities (hydraulic conductivities) ranged from 8.0×10^{-9} cm/sec to 1.4×10^{-8} cm/sec. Plasticity indices (PIs) ranged from 8 to 20 with liquid limits of 31 to 43. Moisture content tests indicate the existing cover materials are generally on the dry side of the PI range (between 7.3 and 22.4 percent) near the surface and moisture content increases with depth.

3.3 Leachate Head Analysis

TMW1 and TMW2, located in the deepest part of the main landfill, encountered leachate approximately 12 feet below the landfill surface. TMW3 and TMW4 are located in southern part of the landfill in an area topographically lower than the main landfill; both were located near the edge of the estimated landfill boundary. TMW3 encountered leachate (or groundwater) approximately 12 feet bgs. TMW4 encountered an abundant water-bearing sand seam below the fill soils 12 feet bgs. TMW5 encountered leachate at a depth of about 2 feet bgs in the Panhandle.

Saturated soil conditions were observed in the soil borings at varying depths from 2 feet to 16 feet bgs in the main landfill area. Static water levels taken from the temporary monitoring wells (TMW1 through TMW4) are shown in Table 4. Water level data is determined to be too variable to construct a representative isopach map. Leachate elevations ranged from 676 to 685, and groundwater elevations were lower (667 to 671). The leachate appears to be mounded within the waste/refuse.

Based on water level data from the current permanent monitoring wells, the water table southeast of the landfill (natural water table) is approximately 8 feet bgs (elevation 665). This is consistent with observations at TMW4, where depth to water was at elevation 667.

Leachate level observed from TMW5 in the "Panhandle Area" was less than 2 feet bgs, indicating bath-tub effect of surrounding clay soils. Also, the Panhandle Area is topographically lower than the main landfill and is adjacent to Skokie River.

Leachate/groundwater analytical results have been tabulated and compared to both IEPA Class I and Class II Groundwater Quality standards, and General Use (Surface) Water Quality standards. Leachate and groundwater analytical data is shown on Table 5. The highest concentrations were found at TMW1, TMW2 and TMW3. Leachate results were within the range of common sanitary landfill leachate (Corbitt, 1998). TMW4, which was installed just outside of the estimated landfill limits, encountered groundwater. TMW5 installed in the Panhandle Area exceeded most criteria.

VOCs detected in the sample collected from TMW1 are summarized on Table 6 and include: toluene, ethylbenzene, xylenes, 1,2,4-trimethylbenzene, p-isopropyltoluene, 1,4-dichlorobenzene, and naphthalene. The detected VOCs were below groundwater remediation objectives, as defined in TACO. Laboratory test data is included as Appendix C.

3.4 Landfill Gas Evaluation

The information collected during the Site investigation was used to assess the migration pathways and the number and location of future gas vents. Methane gas was detected at all sampling locations, and concentrations ranged from 0.3 to 73.8 percent. Landfill gas results are presented on Table 2. Elevated gas readings (above 50% methane) were generally found along the west side of the landfill, although high readings were also found in the southeast part of the landfill. High gas concentrations and pressures are anticipated in areas of the landfill which were not probed during the field investigation. For example, lower explosive limit (LEL) readings were recorded during the installation of TMW1 and TMW2 and exhibited pressure build-up on multiple occasions. Both

TMW1 and TMW2 are located in the central part of the landfill. Methane gas concentrations of 64.1% were recorded in the Panhandle Area. The Toltest 2001 study concluded methane gas is present in the subsurface environment sporadically throughout the Supply Side Landfill, and that the existing gas vents appear to be succeeding in removing the methane from the subsurface in most areas of the landfill. The investigation results appear to confirm the general gas concentration ranges reported from the previous study (Toltest, 2001). Otherwise, there is no correlation between the previous (Toltest, 2001) gas study and the current investigation results.

As a result of elevated readings, additional probes were set around the perimeter of the main landfill and the Panhandle. Only GP-24 and GP-25 along the west side of SSL indicated significant levels of methane. Methane in this area may be related to natural organic decomposition due to wetland deposits. None of the other probes along the perimeter indicated significant levels of gas, and there does not appear to be off-site migration of methane gas from the landfill.

Generally little to no elevated methane gas concentrations were detected in the existing gas vents. Only four vents indicated the presence of methane, and one only indicated carbon dioxide. Results are presented in Table 7. It appears as though many of the existing gas vents do not extend through the existing cover system or have been "watered out". The "operational vents" were located along the east and west sides of the landfill (see Figure 1).

3.5 Surface Water Evaluation

Based on the topography of the Site, surface water runoff is directed to the wetlands area to the west, and Skokie River to the east via sheet flow. Some direct runoff may occur from well established vegetative side slopes adjacent to the River. Minimal runoff occurs from the grassey areas in the southeast part of the landfill where grades are gentle and vegetation is well established. Minimal runoff is expected from the "Panhandle Area" due to the flat ground surface.

As part of the quarterly groundwater monitoring program, surface water samples S101 (upstream) and S301 (downstream) were collected from 1985 to 1996. Locations are shown on Figure 2.

Surface water results have been tabulated and compared to IEPA General Use Water Quality Standards as presented in Appendix D. The tables include average and maximum values of each parameter, and samples exceeding the IEPA water quality standard are highlighted. For calculation purposes, one-half the laboratory detection limit was used for values less than the detection limit. Since the data was generated from multiple laboratories under different regulatory standards, some of the calculated detection limits exceed the surface water standard, as noted on the table.

As an indicator of determining which samples are impacted, the data was evaluated by comparing the average and maximum concentrations, number of sample exceedances, and downstream to upstream values.

Upstream and downstream concentrations of each parameter were similar. The number of exceedances by parameter for each location is shown on Table 8. As shown on the table, the upstream sampling location had a slightly greater number of exceedances than the downstream location. The upstream location is immediately upstream of the Panhandle Area. The upstream location is downstream of Forrestal Landfill. These exceedances may be due to natural or anthropogenic sources, and may or may not be the result of Supply Side Landfill activities.

3.6 Groundwater Monitoring System Evaluation

3.6.1 Groundwater Classification

A groundwater classification of Class I is assumed since the Site has not been classified as having Class II groundwater. However, tables show both Class I and Class II standards for comparison with current and historical groundwater data. In any event, a Land Use Control Memorandum of Understanding (LUC-MOU) for NSGL prohibits the use of shallow groundwater for potable purposes.

3.6.2 Groundwater Monitoring Well History

Historical quarterly groundwater monitoring data obtained through the NSGL project and FOIA file review spans the period from November 1983 to October 2002 and includes both original and replacement monitoring wells. The original wells were installed in 1983 and consisted of G101, G102, G103, and G104, as shown on Figure 2. These wells were sampled until 1996 (except that G101 was not sampled after 1992 due to damage). Off-site gas monitoring wells were sampled as part of the quarterly monitoring in 1995 and 1996; these wells were designated G105, G106, and G107. No data was available for 1997 and 1998 for any of the original groundwater monitoring wells.

Because the original wells were no longer functional, six replacement wells (MW-A, -B, -C, -D, -E and -F) were installed by Toltest in September 1998. The locations of the replacement monitoring wells are shown on Drawing 1. The relationship between the original and replacement wells is shown in Table 9.

The new monitoring wells were completed in silty clays and clays. MW-C was completed in sand seams and clay. Well depths ranged from 13 to 15 feet deep. Static water level data generated by Toltest is shown on Table 10. These wells have been sampled quarterly from 1999 to present. Static water levels were measured intermittantly during this period. For both the original and replacement wells, groundwater has been analyzed for the parameters specified by the IEPA.

3.6.3 Analytical Results Summary

Groundwater results for the 1983-1996 period have been tabulated as presented in Appendix E. Groundwater results for the 1999-2002 period have been tabulated and are included in Appendix F. The tables include average and maximum values of each parameter, and samples exceeding the IEPA Class I groundwater standard are highlighted. For calculation purposes, one-half the laboratory detection limit was used for values less than the detection limit. Since the data was generated from multiple laboratories under different regulatory standards, some of the calculated detection limits

exceed the groundwater standard, as noted on the table. Due to improvement in detection limits, data quality is expected to improve over time.

As an indicator of determining which wells are impacted, the data was evaluated by comparing number of sample exceedances, the average concentrations, and downgradent to upgradient values of indicator parameters. Overall concentration trends of each well were also evaluated, where applicable. Since the number and locations of the replacement wells differs from the original well placement, each data set has been treated separately:

Original Monitoring Wells

The number of exceedances by parameter for each well is shown on Table 11. Downgradient wells have a significantly greater number of exceedances than G101 (upgradient well). On average, downgradient well G102 indicated the highest concentrations of chloride, sulfate, TDS, TOC, iron, lead, and manganese, and downgradient well G103 indicated highest concentrations of ammonia. Upgradient well (G101) reported the highest concentration of phenolics. The exceedances in the upgradient well may be due to natural or anthropogenic sources. For example, the presence of phenolics in G101 is likely from a man-made source. The downgradient exceedances are likely the result of landfill operations.

Groundwater data for the off-site gas monitoring wells (also used for groundwater monitoring) is included in Appendix E. In general, the off-site monitoring wells indicated lower concentrations than the downgradeint wells. Wells MW6 and MW7 indicated higher concentrations and number of exceedances for some of the indicator parameters (chloride, sulfate and TDS) than MW5, possibly because MW6 and MW7 are closer to the landfill area.

Replacement Monitoring Wells

The number of exceedances by parameter for each well is shown on Table 12. Downgradient wells, particularly MW-B, have a significantly greater number of exceedances than MW-C (upgradient

well). The exceedances in the upgradient well may be due to natural or anthropogenic sources. The downgradient exceedances are likely the result of landfill operations.

On average, downgradient well MW-A exhibited the highest concentrations of ammonia and iron. The highest average concentration of chloride, TDS, TOC, and lead was reported in MW-B. The highest average concentration of phenolics and manganese were reported in MW-F. The highest average concentration of sulfate was reported in MW-C (upgradient well).

The off-site wells (MW-D and MW-E) indicated fewer exceedances and lower concentrations than those detected in the downgradient wells.

3.6.4 Conclusions

Concentrations in the downgradient wells appear to be decreasing, as evidenced by the generally lower concentration than those reported in the original monitoring wells. This seems to indicate a trend of decreasing impact from the landfill. The off-site wells do not appear to be impacted, as concentrations are in the range of those reported in the upgradient well.

In addition, MW-C appears to be adequate as a background monitoring well, due to the few number of exceedances. Certain parameters (eg. manganese) were detected in all monitoring wells, and may be naturally occurring and not indicative of landfill contamination.

No groundwater monitoring wells are located in the vicinity of the "Panhandle Area". It is not possible to assess the possible impact to groundwater.

Potable water supplied to the Naval Base comes from Lake Michigan and is treated at the Naval Base Water Treatment Plant. Therefore, groundwater consumption is not a public health concern.

4.0 END USE

4.1 General Considerations

NSGL plans to redevelop the landfill for beneficial use, due in part to open space limitations on the Naval Base. The Navy Moral Welfare and Recreation (MWR) unit plans to use the property for outdoor recreational use. Possible end uses discussed with NSGL include BMX biking, hill roller/snow boarding, walking/hiking trails, and camping sites.

Any property development will occur above the final cap, so that the integrity of the cap is maintained. NSGL will enter a land-use restriction with IEPA to assure construction does not impact the integrity of the final cap or any of the related components.

Landfill cover modification plans have considered the end-use in the following ways:

- cover slope (flat gentle slope), utilizing maximum extent of land surface
- gas management with minimum obtrusiveness (all vents protruding surface placed on west side of landfill)
- majority of sheet runoff flow to Skokie River (no detention basin)
- provision for access by roads on the south and north sides
- extent of regraded area to be above elevation 674 (flood plane elevation).

4.2 End Use Concepts

The regrading and landfill cover modification plan also includes vegetating the cover soils with a typical vegetation seed mixture consisting of bluegrass and fescue, creating a simple grassed area. At a minimum, the area will be a typical natural grassland area, but with a few additions, it can also be a recreational use area for the public.

In concept, the basic end use designs envisioned for placement on top of the cover system at the Supply Side Landfill area consist of any or all of the following features:

- A system of gravel or paved walkways winding through the resulting nature area. The walkways can serve as a system of paths and trails for biking, hiking, running, walking, horseback riding, and/or cross-country skiing.
- Soil berms or landscape mounds, with native prairie grass and wildflower plantings on the mounds, placed in various locations to enhance the beauty of the area.
- Picnic, campground, and/or playground areas associated with the path system.
- A star gazing hill as an offshoot of the path system
- Sport fields and athletic areas for soccer, softball, baseball, football, volleyball, and/or batting cage practice areas.
- A rugged mountain-bike and/or dirt-bike course or trail
- A skateboard park
- A golf chipping practice area with a green, fringe, and sand traps

5.0 PERMITS

5.1 General Review

Versar has reviewed regulatory requirements to determine applicable construction or development permits and approvals at the local, state and federal levels. The review covered the areas of air, water, solid waste, other environmental concerns.

As a government entity, NSGL is generally not required to obtain permits from state and local agencies. However, regulatory standards are still applicable. NSGL will coordinate applicable regulatory correspondance with appropriate local, state, and federal agencies. NGSL will provide the IEPA Federal Facility Section opportunity to review the engineering.

The permit review assumed certain design factors for the final cap:

- Passive gas venting system
- Final grade will slope majority of stormwater to Skokie River.
- Construction near and possible filling-in of wetlands.
- Construction near or in floodway
- No leachate collection
- No stormwater detention

5.2 Federal Permit Issues

Due to the close proximity of the landfill to Skokie River, construction in the floodplain and/or floodway becomes a special concern. The current Flood Insurance Rate Map (FIRM) Lake County, Illinois, Panel 186 of 295 indicates the area inundated by the 100-year flood includes the southeast portion of the landfill. Apparently the map is out of date and requires revision. The FIRM also shows the Regulatory Floodway extending toward the landfill approximately 50 feet from Skokie River. The FIRM is one of the factors used in determining watershed permit requirements. To avoid

floodway/floodplain issues, the regrading area has been limited to elevation 674, which is above the current floodplain.

Additionally a Section 404 (Dredge and Fill) permit may be required by the Corps of Engineers for activities impacting wetland or drainage areas. Certain federal projects may be exempt from permit requirements.

5.3 State Permits

No permit is required by Illinois Department of Natural Resources/office of Water Resources (IDNR/OWR), for land disturbance outside of the floodway.

5.4 Local and County Permits

The East Skokie Drainage District (ESSD) requires review of plans before construction. ESDD is concerned with construction within their easement and any material modifications to the River. NSGL will address watershed permit requirements with the ESDD.

No permit is required by Lake County Stormwater Management Commission (SMC), but NSGL will address the conditions of the SMC Ordinance.

6.0 LANDFILL CLOSURE SYSTEM MODIFICATIONS

6.1 Excavation and Consolidation of Panhandle Area Waste

Field investigation activities verified that a suspected area located northeast of the main landfill contained buried refuse (this area was identified as the "Panhandle Area"). Based on data collected during the field investigation, this irregular-shaped area contains approximately 5,700 cubic yards of waste/refuse, and is between Building 3503 and Skokie River. Soil borings indicated the waste/refuse is approximately 12 feet deep. The Panhandle Area is not contiguous with the main landfill.

It is recommended that waste/refuse in the Panhandle Area be exhumed and consolidated with the main landfill for the following reasons:

- Refuse is saturated and in close proximity to Skokie River, and poses a potential leachate source to the River;
- Refuse is exposed at the surface, and there is no soil cover;
- Buried waste, in its current form, presents a potential future environmental liability; and
- The refuse can be efficiently consolidated within the main landfill during regrading operations, prior to installation of the final cover.

Drawing No. 9 illustrates the excavation plan and final grading plan for the Panhandle Area. The cut volume is approximately 5,700 cubic yards and the subsequent fill volume is 5,460 cubic yards.

6.2 Landfill Regrading

Based on the aerial survey, the crown of the landfill configuration runs north-south approximately in the middle of the landfill. In order to optimize end use possibilities, it is recommended that the existing landfill surface be regraded to create a flat plane surface with a gradual slope from west to east across the top of the landfill. The new crown of the regraded landfill will be constructed along

the western edge of the landfill. The regrading plan requires approximately 34,586 cubic yards of cut (including 5,700 cubic yards from the Panhandle Area) and 31,206 cubic yards of fill volume. Regrading plan details are shown on Drawing 5 (see Section 7.1). Approximately 3,500 cubic yards of clean fill from the cut volume is planned for use as fill in the Panhandle Area.

A 3 percent slope will be used on the top surface of the landfill for drainage and erosion protection. A 3.0 (horizontal) : 1.0 (vertical) slope will be used around the perimeter of the landfill to tie into existing grade. Drawings 6 and 7 (see Section 7.1) present final grading plan details for the low permeability soil layer and the vegetative soil layer. Cross sections are shown on Drawing 10. Regrading operations will not cut into existing waste in the main landfill, except as may be necessary around the perimeter of the landfill to key the final cover into the natural clay soils. Excavated waste materials will be placed on the lowest areas of the existing landfill and under the new final cover system.

Waste material in the Panhandle Area will be exhumed and consolidated with the main landfill. Exhumed waste from the Panhandle Area will be placed in the lowest possible areas of the existing landfill to ensure adequate cover under the new final cover system.

Monitoring wells MW-F and MW-G will be protected during regrading operations and extended to 3 feet above top of final grade to permit continued use of these wells.

6.3 Landfill Cover System

The field investigation indicated that existing cover material overlying refuse includes a variety of silty sand and low permeability soils. The existing cover material complies with sanitary landfill requirements and original design standards (STS, 1983). However, the field investigation indicated that some areas of the landfill lacked adequate impermeable soil cover thickness.

Final cover design is based on proposed end use for the Supply Side Landfill Site, available cover materials, material grading and placement costs, and schedule. Other design considerations include

the footprint of the existing landfill, existing Site conditions, flood way restrictions, and applicable state and local regulations.

Consistent with standard practices and engineering standards, the final cover will consist of 18 inches of low permeability clay with 6 inches of topsoil to promote vegetation. The final cover may be increased to 24 inches of low permeability clay with 6 inches of topsoil around the perimeter of the landfill where the slopes key into the existing ground surface to help protect against erosion.

A borrow source has been identified near the Site which will provide sufficient quantities of silty clay soils. A geotechnical investigation has determined the proposed borrow materials are suitable as low permeability soil for the modified cover system (see Appendix G). A borrow source has also been identified for the topsoil required for the Site. NGSL is stockpiling up to 22,000 cubic yards of topsoil for the project Site.

General backfill material will be placed in the Panhandle excavation and covered with 6-inches of topsoil to match existing grade. Topsoil will be seeded with a mixture of bluegrass and fescue to establish vegetation and provide erosion control.

The subgrade portion of the gas management system will be installed, as detailed in Section 6.4, as part of cover construction

HELP Modeling Evaluation

The Hydrologic Evaluation of Landfill Performance (HELP) Modeling was conducted to compare precipitation through existing surface and proposed final cover systems. HELP Model Version 3.07 was developed by US Army Corps of Engineers for USEPA. HELP computer program is a quasi two dimensional hydrologic model of water movement across, into, through, and out of landfills. The model accounts for the effects of surface storage, runoff, infiltration, evapotranspiration (ET), vegetative growth, soil moisture storage, lateral subsurface drainage, unsaturated vertical drainage, and leakage through soil liners. Model inputs include weather, soil characteristics, cover thickness,

cover slope, and vegetation. Model outputs are amount of runoff, ET, drainage, leachate, and liner leakage.

Boring logs, topographic map and Site reconnaissance were used to determine soil characteristics and thickness of the existing cover. Due to the variability of existing soil cover thickness, the existing cover was divided into a 12-inch top layer of loose topsoil/sandy clay and a 24-inch bottom layer of silty clay. This is also consistent with the landfill specifications (STS, 1983). The barrier clay layer thickness was assumed less than actual field conditions to account for the nonuniformity of different materials encountered (eg. silty clay with gravel, crushed limestone, etc.) during the subsurface investigation. Landfill slope and length of the existing cover were determined from the topographic map and the cross-section drawings. A poor stand of grass and evaporative zone depth of 6 inches was assumed.

For modeling the proposed cover, borrow soil geotechnical data (Versar, 2003) and the proposed cover criteria were used for the landfill soil and thickness characteristics. Landfill slope and length of the proposed cover were determined from the final grading plan and the cross-section drawings. A good stand of grass and evaporative zone depth of 6 inches was assumed. Both model simulations used ET and weather data obtained for Chicago, Illinois.

The detailed assumptions of soil profile in HELP model are listed as follows:

- Existing cover consists of 12 inches topsoil/clayey sand with hydraulic conductivity (k) on the order of 1.2×10^{-4} cm/sec, underlain by 24 inches silty clay with hydraulic conductivity on the order of 3.3×10^{-5} cm/sec.
- Proposed cover consists of a 6-inch topsoil layer with hydraulic conductivity on the order of 1.2×10^{-4} cm/sec, underlain by a 18-inch well compacted clay layer with hydraulic conductivity on the order of 1.0×10^{-7} cm/sec.

The HELP model was run for the existing cover as well as the proposed cover simulating a 30-year period. Results are printed out and included as Appendix H. Model data inputs and outputs are summarized in Table 12.

Based on HELP Model results, the existing cover has an average annual percolation (leakage through cover) of 9.04 inches (28%), 4.7 inches (14%) runoff, and 18.9 inches (58%) ET. The proposed cover has an average annual percolation of 0.86 inches (3%), 8.5 inches (26%) runoff, and 23.3 inches (71%) ET. Therefore, the proposed design indicates the new landfill cover system reduces infiltration by an order of magnitude. In addition, runoff and ET are increased through improved vegetative cover.

6.4 Gas Management System

Based on the field investigation and general site observations, the existing methane gas vent system has limited effectiveness since many of the vents do not appear to extend through the existing cover system into the underlying waste. In addition, the existing vent system is obtrusive and inconsistent with proposed end use.

The Toltest (2001) and Versar gas investigations concluded that elevated gas concentrations exist throughout the landfilled area. Since the existing gas vents are generally ineffective at this time and will be in the way during regrading of the landfill, it is recommended they be removed (or cut back below grade) and a new passive methane gas venting system should be designed and installed to cover the main landfill area.

The new passive gas venting system consists of shallow trenches excavated within the waste material, with horizontal collector pipes in granular bedding leading to passive vents. The design (i.e., vent spacing, depth and location of trenches, diameter of collector pipes, gradation of pipe bedding, etc.) of the gas vent system will be based on the landfill and waste characteristics. A minimum number of vents will protrude through the ground surface and be located along a roadway on the west side of the landfill. The layout of Gas Management System is shown on Drawing 13 (see Section 7.1). Details of the gas management system are shown on Drawing 14 (see Section 7.1).

The gas extraction trenches consist of perforated HDPE horizontal pipes within a gravel backfilled trench. Gravel filled bores will also be placed along the trench spaced at approximately 100 feet

apart. Each trench is also equipped with a top sheet of flexible geomembrane to protect the gravel pack from surface water infiltration. Based on typical gas extraction trench radius of influence, the trenches are spaced at approximately 185 feet apart.

Each gas extraction trench is equipped with a gas extraction trench vent assembly that terminates above ground with a stainless steel wind driven rotary ventilator. The gas extraction vent assemblies are located on the west end of the gas extraction trenches. A vacuum will be induced on the gas extraction trench from the ventilators. Positive pressure from the landfill gas is also used to push gas through the gas extraction vent. A control valve is installed below the ventilator for isolation of the gas vent during gas vent maintenance periods.

The east end of the gas extraction trenches (the low point of the gas extraction trench piping system) is equipped with a trench cleanout riser. These cleanout risers can be used to pump out any liquids that accumulate at the trench low points. All of the gas extraction trenches are sloped from west to east, consistent with the cover slope.

6.5 Surface Water and Erosion Controls

The 100-year flood plain currently depicted on the FIRM (FEMA, 2000) does not reflect actual Site conditions. The location of the 100-year flood plain for Skokie River needs to be determined and/or adjusted in conjunction with the design of the final cover modifications. NSGL has agreed to pursue this issue with FEMA and Lake County. The area of regrading has been limited to areas above elevation 674, to avoid construction within a flood plain.

The Erosion Control Plan during construction of the SSL cover modifications is presented in Appendix I. Erosion controls will include silt fencing around the perimeter of the regrading limit, and placement of straw bales at locations subject to gully erosion, as shown on Drawing 8 (see Section 7.1).

The gentle top slope of the landfill will permit the continued use of the existing stormwater management approach of sheet drainage coupled with improved erosion control methods along the south ditch and Skokie River.

6.6 Groundwater Controls

The existing groundwater monitoring network should continue to be used for monitoring the landfill. The landfill is not regulated by an IEPA solid waste permit; however, quarterly monitoring data has been collected since 1983. Upon completion of final cover modification construction activity, NSGL will discontinue groundwater monitoring based on concurrence with the IEPA Federal Facility Section.

The existing monitoring wells will be unaffected by construction, except MW-F and MW-G which will be extended, as previously discussed in Section 6.2. Groundwater monitoring is discussed further in Section 8.3.

7.0 CONSTRUCTION PLANS AND SPECIFICATIONS

7.1 Construction Plans

Construction plans and details covering waste consolidation and regrading, construction of the modified landfill cover system, the gas management system accompany this report:

Drawing 0	Title Sheet
Drawing 1	Existing Site Conditions Map
Drawing 2	Field Investigation Locations
Drawing 3	Existing Top of Waste Contours
Drawing 4	Existing Cover Soil Thickness Isopach Map
Drawing 5	Proposed Regrading Plan (Top of Waste/Soil)
Drawing 6	Proposed Top of 18" Low Permeability Soil Layer Plan
Drawing 7	Proposed Top of 6" Vegetative Soil Layer Plan
Drawing 8	Erosion Control and Vegetation Plan
Drawing 9	Panhandle Area Construction
Drawing 10	Cross Sections
Drawing 11	Isopach Map - Existing Topo to Regraded Waste/Soil Surface
Drawing 12	Isopach Map - Existing Top of Waste Surface to Regraded Waste/Soil Surface
Drawing 13	Gas Management System Plan
Drawing 14	Gas Management System Details

7.2 Material Specifications

Material and placement specifications for general fill in the Panhandle Area, subgrade, low permeability soil layer, vegetative soil layer, geotextile material and road aggregate are presented in Appendix J.

7.3 Material Quantities

Construction material quantities have been developed for regrading, cutting and filling and construction of the gas management system. These quantities are included in Appendix K.

7.4 Construction Quality Assurance

Construction Quality Assurance is necessary part of to assure the work is conducted in accordance with engineering plans and specifications and to provide documentation of the work. Construction quality assurance activities will confirm that construction is done in accordance with the design through random testing of materials, verification that materials meet design specifications, and documenting that specified construction procedures are followed. The Construction Quality Assurance (CQA) Manual is provided in Appendix L.

8.0 OPERATIONS AND MAINTENANCE

The following information describes the long-term operations and maintenance (O&M) activities to be performed at the Supply Side Landfill. The maintenance and inspection activities will begin upon completion of regrading and cover application. At no time will additional refuse be accepted at the Site during the long-term O&M period.

At a minimum, long-term O&M activities will consist of the following:

- maintaining the integrity and effectiveness of the final cover, including any required repairs;
- maintaining and operating the landfill gas management system; and
- maintaining the groundwater monitoring systems.

The following section provides a description of each facet of the long-term O&M plan.

8.1 Landfill Cover System

Semi-annual inspections will be performed on all vegetated surfaces during the long-term O&M period. The final cover will be repaired in areas where rills, gullies and crevices six inches or deeper have been identified. Areas of final cover which are identified as being particularly susceptible to soil erosions will be repaired. Also, any holes or depressions which had been created by differential settling and may promote ponding of surface water will be repaired. Excessive differential settlement of the final cover is not anticipated. Rather, settlement of waste and final cover is expected to be generally uniform in nature. The repairing of final cover defects will involve regrading of the final cover to continue to promote positive surface water drainage and management.

All areas of the final cover which have been repaired due to erosion, scouring, desiccation, settlement or other causes will be re-vegetated. Mowing of the landfill area will be performed twice per year.

Long-term erosion and soil loss is anticipated to be minimal following the regrading, cover application activities, and vegetation establishment due to the presence of a very gradual top slope over the vast majority of the landfill and good stand of vegetation. For cost estimating purposes, it is assumed that repairs to the cover will be performed at a rate of approximately ½ acre per year. The cost estimate for the landfill cover system O&M is provided in Table 14.

8.2 Landfill Gas Management System

A landfill gas management system will be installed during cover application and will continue to be operated throughout the long-term O&M period, or until approval is obtained from the IEPA to cease operations. Semi-annual inspections will be performed on the above ground portions of the gas system. Inspection work will include checking to see that the gas venting system ventilators operate properly; that bird nests or other debris have not collected and clogged the ventilators; that the valves operate properly; that the pipe caps are intact; and that no pipe cracks are present.

It is anticipated that minor repairs may be necessary to assure the proper operation of the landfill gas management system. These repairs may entail cleaning out collected debris, maintaining or replacing ventilators and valves, or replacing cracked pipe sections. Dewatering of liquids from the landfill gas management system cleanout risers may also be performed as necessary during the semi-annual inspections. Dewatering, when necessary, is anticipated to be performed via use of a vacuum truck. The cost estimate for the landfill gas system O&M is provided in Table 14.

8.3 Groundwater Monitoring

SSL has a groundwater monitoring plan which is currently being utilized. The groundwater monitoring plan may be modified at a future date. Modifications to the plan will be reported to and negotiated with the IEPA Federal Facility Section. The current system of ground water wells will be inspected on a semi-annual basis and repairs to the system will be performed as needed pursuant to the semi-annual inspections. The cost estimate for the landfill groundwater monitoring O&M is provided in Table 14.

8.4 Miscellaneous

Minor repairs may be necessary throughout the long-term O&M period to ensure the integrity of other site features such as fencing and roads. Determination of the need of these repairs will be made during the routine inspections of the final cover. Repairs will be made as warranted. The cost estimate for miscellaneous repairs is provided in Table 14.

All site inspections will be documented and records will be kept at the NSGL Environmental Department office. The documentation will address problems found and corrective actions taken.

9.0 CONSTRUCTION COST ESTIMATE AND SCHEDULE

9.1 Cost Estimate

Two construction cost estimates have been prepared for the proposed SSL landfill cover system modifications as described in Sections 6.0 and 7.0. One estimate assumes the required cover soils will be available from NSGL sources and stockpiled at the Site, and one estimate is based on importing the necessary cover materials.

The estimated cost to construct the proposed landfill cover modifications outlined herein using soils available from NSGL sources is $896,758. The estimated cost to construct the proposed landfill cover modifications using imported soils from off-site sources is $1,415,508.

Both engineering cost estimates are included in Appendix M.

9.2 Construction Schedule

Versar estimates approximately 12 weeks will be required to construct the landfill cover system modifications described in this report. A proposed bar chart construction schedule is presented in Appendix N.

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TABLES

Table 1
FIELD INVESTIGATION SUMMARY
Supply Side Landfill
Naval Station Great Lakes
Great Lakes, Illinois

Sample Type	No. of Borings/Samples	Analysis
Soil Borings (cover thickness)	23	Soil classification
Soil Borings (outside of landfill)	10	Soil classification
Geotechnical Samples	28	Moisture, Atterberg limits, hydraulic conductivity, and soil classification.
Gas Probes Samples (both inside and outside of landfill)	33	Methane, carbon dioxide, oxygen, and pressure
Gas Samples (from existing vents)	17	Methane, carbon dioxide, and oxygen
Leachate/Groundwater Samples (temporary monitoring wells)	5	Leachate indicator parameters, and VOCs

Notes:

Leachate indicator parameters include ammonia, chloride, sulfate, total dissolved solids, total organic carbon, phenolics, iron, lead, manganese, and pH.

VOCs=Volatile Organic Compounds

Table 2
FIELD TEST DATA
Supply Side Landfill
Naval Station Great Lakes
Great Lakes, Illinois

Gas Probe	Sample Collection Date	Peak Methane (%)	Carbon Dioxide (%)	Oxygen (%)	Static Press (in. water)	Gas Probe depth (ft bgs)	Top of Waste (ft bgs)	Saturated Zones (ft bgs)	Comments
1	11/19/02	2.3	2.5	19.6	-0.1	7	12	7.5	Gas readings taken from cap.
2	11/18/02	32.6	21.6	20.2	-0.1	16	NA	3 & 16	No waste observed
3	11/18/02	61.1	42.6	0	47.2	8	2.5	5.5	
4	11/18/02	73.8	28.4	0	18.9	6	6	4 & 8	
5	11/18/02	67.3	32.2	0.7	-0.2	5	3.5	None	
6	11/19/02	0.3	0.4	19.8	0.1	8	3.5	None	
7	11/19/02	6.1	3.4	18.8	0.7	6	NA	None	No waste observed
8	11/19/02	69.3	29.4	0.6	0.6	6	NA	4	No waste observed
9	11/19/02	0.4	1	19.4	0.4	3.5	NA	4	No waste observed
10	11/19/02	64.1	29.3	1.8	0.5	2	Surface	0.5	Panhandle
11	11/19/02	67.1	37.5	0	-0.2	8.5	NA	10	No waste observed
12	11/19/02	5.6	7.4	14.1	-0.2	12.5	NA	3	No waste observed
13	11/19/02	3.8	2.8	18.5	-0.2	7	7	5	
14	11/19/02	63.4	41.2	0	0.3	5.5	5.5	3.5	
15	11/19/02	22.3	10.6	13.4	-0.4	7	NA	3.5	No waste observed
16	11/20/02	0.5	4	11.2	0.4	12	10	None	
17	11/20/02	66.5	40	0	0.2	5	2.5	2.5	
18	11/20/02	34.2	12.8	11.9	0.1	2.5	2.5	2	
19	11/20/02	25.1	8.7	16.1	0.2	5	5	3.5	
20	11/20/02	7.1	4.2	15.2	0.1	4.5	1	None	No refuse/only C&D waste
21	11/20/02	64.1	41.2	0.8	0.1	5.5	3	3	
22	11/20/02	48.1	7.1	13.9	-0.1	2	2	2	
23	11/20/02	7.1	1.6	13.6	-0.1	8	7	None	
24	11/20/02	37.2	18.6	9.1	0.1	6.5	NA	None	No waste observed
25	11/20/02	27.6	8.8	14.6	0.1	1.2	1	None	
26	11/21/02	3.4	1.9	18.6	0	3	NA	None	No waste observed
27	11/21/02	0	0.01	20.1	0.2	3	NA	None	No waste observed
28	11/22/02	0	0.4	20.1	0	3	NA	None	No waste observed
29	11/22/02	0	3.3	18.2	0	2.5	2	None	
30	11/22/02	0	2.5	19.3	0.1	5	NA	None	No waste observed
31	11/22/02	0	0	20.5	0	2.5	0.5	None	
32	11/21/02	0.4	4.6	16.4	0	6	Surface	None	Construction debris
33	11/21/02	0.7	0.7	20.5	0.5	13	Surface	None	Construction debris and grit

Notes:

bgs=below ground surface

Table 3
GEOTECHNICAL TEST RESULTS
Supply Side Landfill
Naval Station Great Lakes
Great Lakes, Illinois

Sample/Depth	Sample Collection Date	Soil Description	Moisture (%)	LL	PL	PI	Permeability (cm/sec)
MW1X/3-5'	11/14/02	Brown silty clay w/ tr. gravel	16.6	39	22	17	
GP3-4'	11/18/02		13.3				
GP4 0-18"	11/18/02	Brown silty clay w/ tr. gravel	15.7	34	18	16	1.70E-08
GP4-4'	11/18/02		8.3				
GP5-3'	11/18/02		17.2				
GP6 1.5-3.5'	11/19/02	Dk. brown & gray silty clay w/ tr. gravel	20.1	37	19	18	8.00E-09
GP7-3'	11/19/02		15.1				
GP7-6'	11/19/02	Dk. brown silty clay	22.4	40	20	20	
GP8-2'	11/19/02	Dk. brown silty clay w/ tr. gravel	21	40	21	19	
GP8-6'	11/19/02		7.3				
GP11-3'	11/19/02		15.2				
GP11-8'	11/19/02		15				
GP12-3'	11/19/02		15.6				
GP12-5'	11/19/02		17.1				
GP13-3'	11/19/02		17.7				
GP14 2-4'	11/19/02	Brown silty clay w/ tr. gravel	15.4	35	19	16	
GP14-5'	11/19/02	Dk. brown silty clay w/ organics	20.6	35	27	8	
GP15 1-2'	11/19/02		15.9				
GP15 2-4'	11/19/02	Brown silty clay	15.9	34	19	15	1.40E-08
MW2/10-12'	11/14/02	Brown silty clay	18.2	43	25	18	
MW2/30-32'	*11/14/02*	*Gray silty clay w/ tr. gravel*	*19.4*	*39*	*23*	*16*	
MW3/1-3'	11/15/02	Lt. brown & brown silty sandy clay w/ tr. gravel	14.9	37	20	17	
GP18-22"	11/20/02		15.8	31	15	16	
GP19-3'	11/20/02	Dk. brown silty sandy clay w/ tr. gravel	13.3				
GP21-2'	11/20/02		18.7				
GP22-1.5'	11/20/02		17				
GP23-6'	11/20/02		17.5				

Notes:

MW2/30-32' was collected from native clay below the landfill.

Geotechnical data also reported on Soil Boring Logs (Appendix A)

Table 4
LEACHATE/GROUNDWATER LEVELS
TEMPORARY MONITORING WELLS
Supply Side Landfill
Naval Station Great Lakes
Great Lakes, Illinois

Well ID	Ground Elev.	TOC Elev.	DTW (below TOC) 11-25-02	Leachate/ Groundwater Elev. 11-25-02	DTW (below TOC) 12-13-02	Leachate/ Groundwater Elev. 12-13-02	Comments
MW1	690.36	692.38	13.3	679.08	11.3	681.08	Leachate
MW2	689.82	691.90	7.3	684.60	15.4	676.50	Leachate
MW3	681.49	684.73	14.0	670.73	14.0	670.73	Groundwater
MW4	677.74	678.74	11.5	667.24	11.6	667.14	Groundwater
MW5	676.65	679.36	4.2	675.16	3.9	675.46	Leachate

Notes:

DTW=Depth to Water

TOC=Top of Casing

Table 5
LEACHATE/GROUNDWATER SAMPLE RESULTS
TEMPORARY MONITORING WELLS
Supply Side Landfill
Naval Station Great Lakes
Great Lakes, Illinois

Sample Location	Ammonia	Chloride	Sulfate	TDS	TOC	Phenolics	Iron	Lead	Manganese	pH
TMW1	120	**1800**	15	**4000**	330	**0.25**	**13**	**0.53**	**0.24**	7.36
TMW2	46	**1500**	**1100**	**14000**	5600	**0.28**	**270**	**0.17**	**17**	**6.13**
TMW3	20	**330**	1.9	**2200**	350	**0.49**	**410**	**9.0**	**7.5**	6.65
TMW4	48	**320**	4.6	**1400**	23	<.005	**140**	**0.11**	**4.1**	6.76
TMW5	58	**660**	4.3	**1900**	330	**0.32**	**130**	**0.13**	**0.89**	**6.46**
Class I GQS (mg/L)	NA	200	400	1200	NA	0.1	5	0.0075	0.15	6.5-9.0
Class II GQS (mg/L)	NA	200	400	1200	NA	0.1	5	0.1	10	6.5-9.0
SWQS (mg/L)	15	500	500	1000	NA	0.1	1.0	*	1.0	6.5-9.0

Notes:

Bold and Highlighted = Exceeds Class I Groundwater Quality Standard

GQS=Groundwater Quality Standard

SWQS=Surface Water Quality Standard

Class I and Class II Groundwater Quality Standards (Title 35, Part 620 Subpart D)

General Use (Surface) Water Quality Standards (Title 35, Part 302, Subpart B)

* Calculated lead standard based on hardness concentration.

Table 6
VOC SUMMARY - LEACHATE
Supply Side Landfill
Naval Station Great Lakes
Great Lakes, Illinois

VOCs	TACO Groundwater Remediation Objectives		Laboratory Reporting Limit	Sample Location/ Date (mg/L)
	Class I (mg/L)	Class II (mg/L)	(mg/L)	TMW1 11/25/02
1,4-Dichlorobenzene	0.075	0.375	0.01	0.045
Ethylbenzene	0.7	1	0.01	0.023
p-Isopropyltoluene	NS	NS	0.01	0.011
Naphthalene	0.14	0.22	0.01	0.030
1,2,4-Trimethylbenzene	NS	NS	0.01	0.022
Toluene	1	2.5	0.01	0.031
m&p-Xylenes	10	10	0.02	0.044
o-Xylene	10	10	0.01	0.022

Notes:

NS=No standard established by IEPA

Tier 1 Groundwater Remediation Objectives for Class I and Class II groundwater (Illinois EPA, Tiered Approach to Corrective Action Objectives, 1977).

Table 7
GAS VENT SURVEY
Supply Side Landfill
Naval Station Great Lakes
Great Lakes, Illinois

Gas Vent No.	Peak Methane (%)	Carbon Dioxide (%)	Oxygen (%)
1	--	--	--
2	--	--	--
3	--	--	--
4	0.7	1.2	20.2
5	I	I	I
6	I	I	I
7	I	I	I
8	1.5	1.8	19.3
9	--	--	--
10	--	--	--
11	--	--	--
12	--	--	--
13	I	I	I
14	--	--	--
15	25	NA	NA
16	--	--	--
17	--	--	--
18	I	I	I
19	--	--	--
20	I	I	I
21	2.7	6.7	16
22	0	2.8	0
23	--	--	--
24	--	--	--

Notes:

Vents tested on 11/26/02, except Vent No. 15 tested on 11/20/02.

--=No measureable gas concentrations.

I=Inaccessible (vent too high to sample).

Table 8
SURFACE WATER SAMPLE EXCEEDANCES
1985-1996
Supply Side Landfill
Naval Station Great Lakes
Great Lakes, Illinois

Location	Ammonia	Chloride	Sulfate	TDS	Phenolics	Iron	Manganese	Total
S 101 (upgradient)	1	5	2	13	6	9	1	37
S 301 (downgradient)	2	5	0	8	3	6	2	26

Note:
Concentrations compared to Title 35, Part 302, Subpart B General Use Water Quality Standards.

Table 9
COMPARISON OF ORIGINAL TO REPLACEMENT WELLS
Supply Side Landfill
Naval Station Great Lakes
Great Lakes, Illinois

Original Well	Replacement Well	Use
G101	None (MW-G* is closest)	Upgradient
G102	MW-A	Downgradient
G103	MW-B	Downgradient
G104	MW-F	Downgradient
G105 (Gas Well MW5)	MW-D and E are across Skokie River and roughly coincide with G105, G106, and G107.	Off-Site
G106 (Gas Well MW6)		Off-Site
G107 (Gas Well MW7)		Off-Site
None	MW-C	Upgradient

Notes:
MW-G not installed as part of Supply Side Landfill project.

Table 10
GROUNDWATER LEVELS
(REPLACEMENT MONITORING WELLS)
Supply Side Landfill
Naval Station Great Lakes
Great Lakes, Illinois

Well ID	Date Measured	Total Depth from TOC (ft)	TOC Elev. (ft)	Depth to Water (ft)	Static Water Level (ft)
MW-A	9/9/98	14.7	96.01	9.03	86.98
MW-B	9/9/98	17.0	95.20	10.83	84.37
MW-C	9/9/98	17.2	99.28	6.04	93.24
MW-D	9/9/98	17.9	94.47	7.57	86.90
MW-E	9/9/98	17.7	94.01	7.78	86.23
MW-F	9/9/98	17.1	100.83	12.60	88.23

Notes:

TOC=Top of Casing

Table 11
GROUNDWATER ANALYTE EXCEEDANCES
(ORIGINAL MONITORING WELLS)
1983-1996
Supply Side Landfill
Naval Station Great Lakes
Great Lakes, Illinois

Well ID	Chloride	Sulfate	TDS	Phenolics	Iron	Lead	Manganese	Total
G101 (upgradient)	8	2	12	2	0	15	8	47
G102 (downgradient)	22	5	41	5	14	29	20	136
G103 (downgradient)	10	5	18	3	14	20	25	95
G104 (downgradient)	5	10	17	2	15	29	25	103

Note:

Concentrations compared to Class I Groundwater Quality Standards (Title 35, Part 620, Subpart D).

Table 12
GROUNDWATER ANALYTE EXCEEDANCES
(REPLACEMENT MONITORING WELLS)
1999-2002
Supply Side Landfill
Naval Station Great Lakes
Great Lakes, Illinois

Well ID	Chloride	Sulfate	TDS	Phenolics	Iron	Lead	Manganese	Total
MW A (downgradient)	0	0	0	1	10	0	13	24
MW B (downgradient)	10	0	11	1	12	1	5	40
MW C (upgradient)	0	0	2	0	0	0	2	4
MW D (cross-gradient)	0	0	1	2	0	0	11	14
MW E (cross-gradient)	0	0	0	3	0	0	11	14
MW F (downgradient)	0	2	1	3	0	0	10	16

Note:

Concentrations compared to Class I Groundwater Quality Standards (Title 35, Part 620, Subpart D).

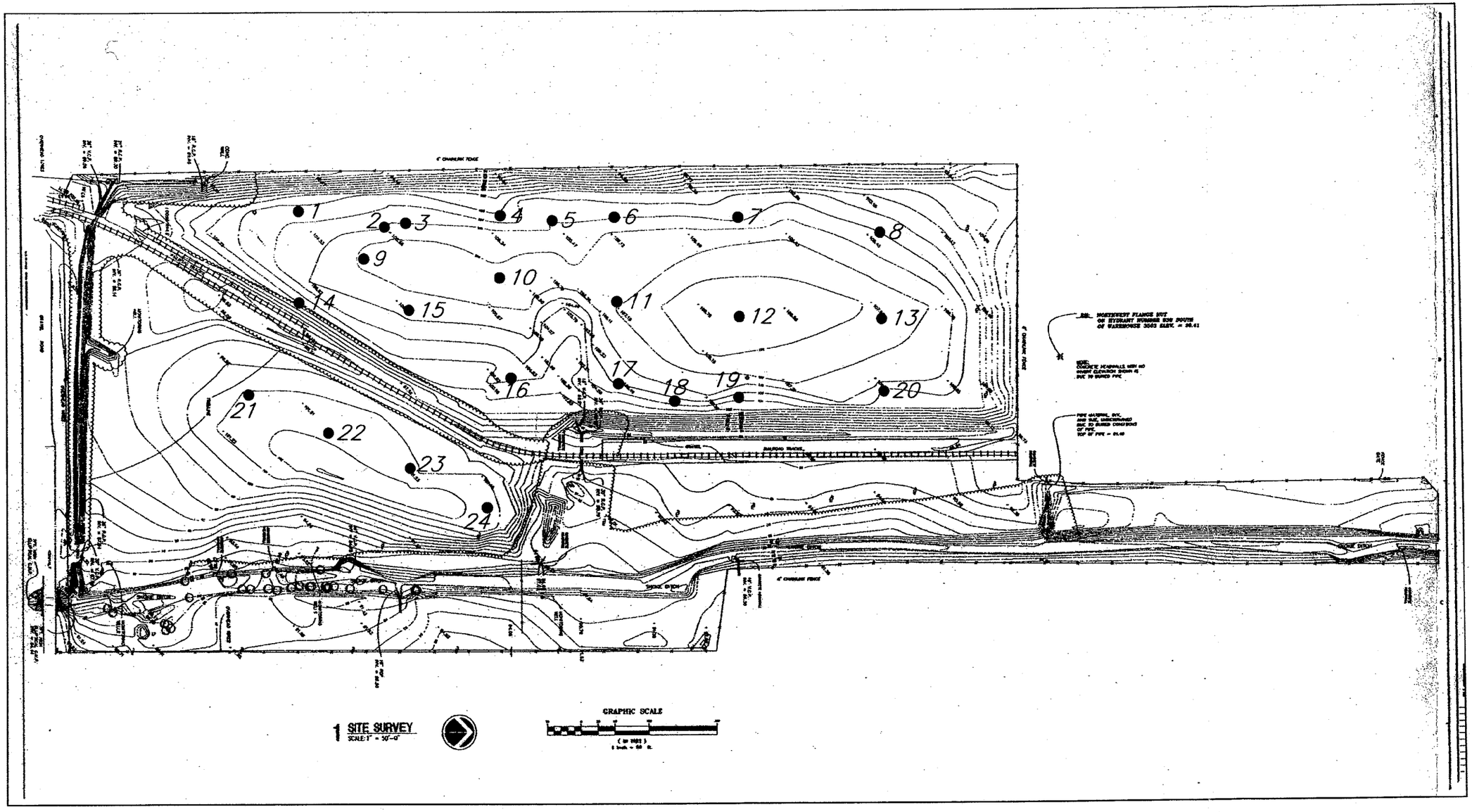
Table 13
HELP MODEL SUMMARY RESULTS
Supply Side Landfill
Naval Station Great Lakes
Great Lakes, IL

Cover Description	Topsoil	Clay cover (Barrier)	Analysis Results
1. Existing Cover	12 inches HELP Soil Type=10 k=1.2 x 10^{-4} cm/sec Poor stand of grass Slope=3%/Length=150 feet	24 inches HELP Soil Type=13 k=3.3 x 10^{-5} cm/sec	Efficiency = 72% (14% runoff, 58% ET) Percolation = 9.04 in (27.7%)
2. Proposed Cover	6 inches HELP Soil Type=10 k=1.2 x 10^{-4} cm/sec Good stand of grass Slope=4%/Length=520 feet	18 inches HELP Soil Type=16 (well compacted clay soil) k=1.0 x 10^{-7} cm/sec	Efficiency = 97% (26% runoff, 71% ET) Percolation = 0.86 in (2.6%)

Table 14
ANNUAL OPERATIONS AND MAINTENANCE COSTS
Supply Side Landfill
Naval Station Great Lakes
Great Lakes, Illinois

1. Cover/Gas System Inspections	
4 hours x $75/hr x 2 times/yr	$600
2. Cover Maintenance	
0.5 acres x 2 feet x $5.50/cy	$8,873
3. Vegetation Maintenance	
0.5 acres x 2,000 acres	$1,000
4. Mowing	
15 acres x $25/acre x 2 times/yr	$750
5. Gas System Maintenance	
Labor - 4 hours x $75/hr x 2 times/yr	$600
Materials - $1000 x 2 times/yr	$2,000
6. Ground Water Monitoring	
Labor - 8 hours x $75/hr x 2 times/yr	$1,200
Analytical - $180/sample x 6 samples x 2 times/yr	$2,160
7. Miscellaneous Repairs	
Labor - 4 hours x $75/hr x 2 times/yr	$600
Materials - $1000 x 2 times/yr	$2,000
TOTAL ESTIMATED ANNUAL O&M COST	**$21,943**

FIGURES

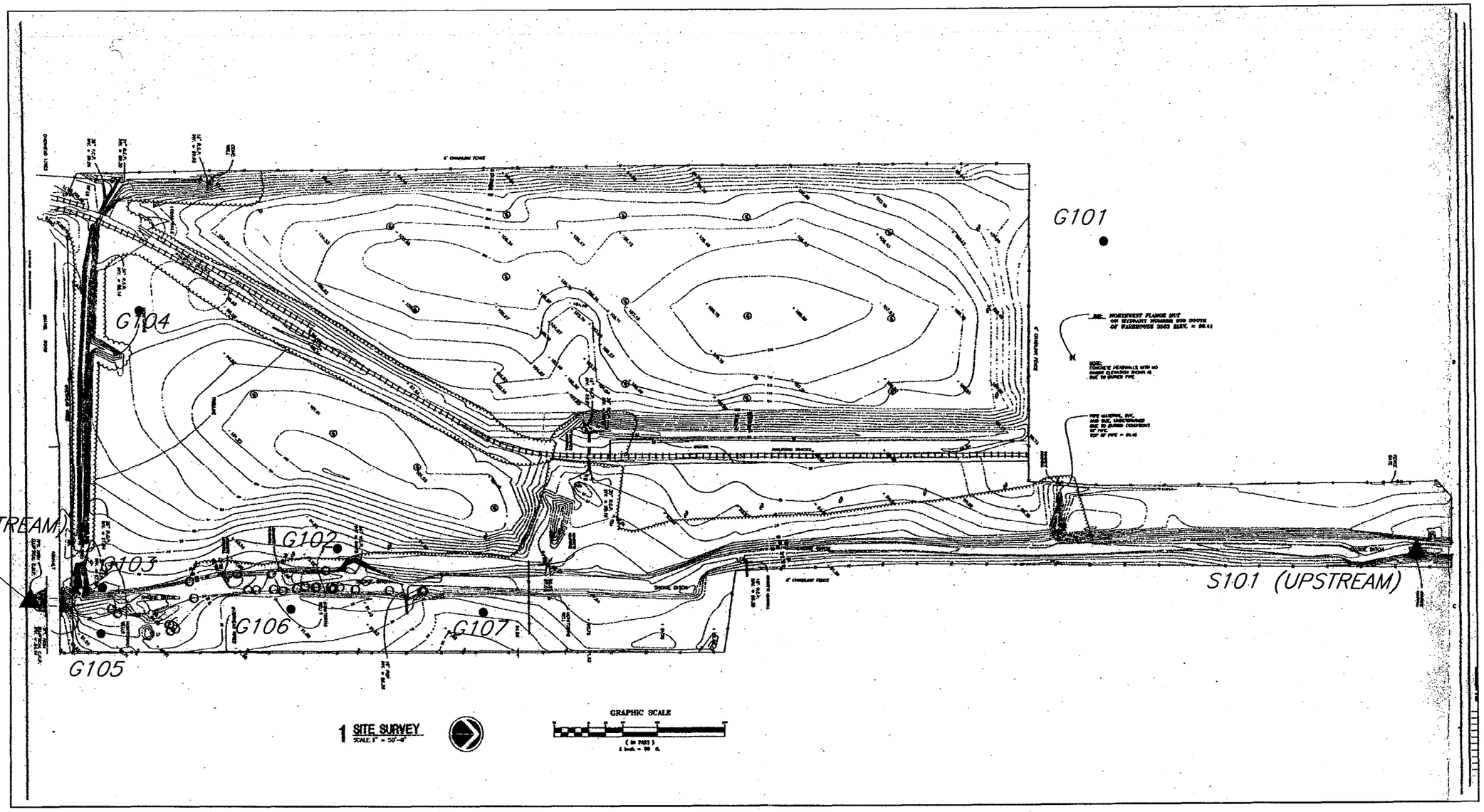


1 SITE SURVEY
SCALE: 1" = 50'-0"

21 • GAS VENT IDENTIFICATION

LOCATIONS BASED ON POST-REPAIR VENT AND MONITORING WELLS LOCATIONS, SUPPLY SIDE LANDFILL (TOLTEST, JUNE 1999).
BASEMAP PROVIDED BY U.S. NAVY (SITE SURVEY, PRIMERA ENGINEERS, 1997).

TITLE:	FIGURE 1 GAS VENT LOCATIONS SUPPLY SIDE LANDFILL, GREAT LAKES ILLINOIS		
CAD: HDP	CHECKED: HDP	APPROVED: JA	FOR:
DATE: 7/9/03	SCALE: RELATIVE		GREAT LAKES NAVAL TRAINING CENTER, GREAT LAKES, ILLINOIS
Versar INC. 200 W. 22nd STREET, SUITE 250 LOMBARD, IL 60148			PROJECT NO. 110684.0001.001 DRAWING NO. LAYOUT



▲ SURFACE WATER SAMPLING LOCATION

• MONITORING WELL IDENTIFICATION

G103

LOCATIONS BASED ON GROUNDWATER MONITORING WELLS, PWC DWG NO. C-1-861, MAY 1984 (NAVY PUBLIC WORKS CENTER, GREAT LAKES, IL) AND K-PLUS ENVIRONMENTAL DWG, MARCH 1995. BASEMAP PROVIDED BY U.S. NAVY (SITE SURVEY, PRIMERA ENGINEERS, 1997)

TITLE: FIGURE 2
ORIGINAL MONITORING WELL AND SURFACE WATER SAMPLE LOCATIONS
SUPPLY SIDE LANDFILL, GREAT LAKES ILLINOIS

CAD: HDP	CHECKED: HDP	APPROVED: JA
DATE: 7/9/03	SCALE: RELATIVE	

Versar INC.
200 W. 22nd STREET, SUITE 250
LOMBARD, IL 60148

FOR:
GREAT LAKES NAVAL TRAINING CENTER, GREAT LAKES, ILLINOIS

PROJECT NO. 110684.0001.001
DRAWING NO. LAYOUT

APPENDIX A

BORING LOGS

BORING LOG

Versar INC.

Client: US Navy
Project: supply side landfill
Location:

Boring No. GP1
Surface Elevation:
Job No. 1106840003002
Sheet 1 of 2

SAMPLE No.	Type	Rec (ft.)	PID (ppm)	Depth (ft.)	Profile	VISUAL DESCRIPTION	REMARKS
						Clay and Sand with gravel (Fill)	
						Topsoil	
						Silty CLAY (CL) with gravel (Fill)	
				5			
						Silty CLAY (CL) with some sand and gravel (Fill)	Set the gas probe at 7 ft. just above the first layer of saturated silty clay fill. CH_4 = 2.3 CO_2 = 2.5 O_2 = 19.6 VP = 0.0
				10			

Continued Next Page

GENERAL NOTES

egin Drilling 11/19/02 Complete Drilling 11/19/02
Drilling Contractor Mid America Drill Rig Not Applicable
Driller NA Logged By T Freudenrich Reviewed By
Drilling Method Geoprobe

WATER LEVEL DATA

While Drilling
At Completion of Drilling
Time After Drilling
Depth to Water

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

BORING LOG

Versar INC.

Client: US Navy
Project: supply side landfill
Location:

Boring No. GP1
Surface Elevation:
Job No. 1106840003002
Sheet 2 of 2

SAMPLE No.	Type	Rec (ft.)	PID (ppm)	Depth (ft.)	Profile	VISUAL DESCRIPTION	REMARKS
						Silty CLAY (CL) with isolated waste	
				15		Organic stained silty CLAY (CL) with waste	
				20		EOB at 19.5 feet	

GENERAL NOTES

Begin Drilling 11/19/02 Complete Drilling 11/19/02
Drilling Contractor Mid America Drill Rig Not Applicable
Driller NA Logged By T Freudenrich Reviewed By
Drilling Method Geoprobe

WATER LEVEL DATA

While Drilling
At Completion of Drilling
Time After Drilling
Depth to Water

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

BORING LOG

Versar INC.

Client: US Navy
Project: supply side landfill
Location:

Boring No. GP2
Surface Elevation:
Job No. 1106840003002
Sheet 1 of 2

SAMPLE No.	Type	Rec (ft.)	PID (ppm)	Depth (ft.)	Profile	VISUAL DESCRIPTION	REMARKS
						Clay and Sand with gravel (Fill)	
						Silty CLAY (CL) with some gravel.	
				5		Silty CLAY (CL) with organics.	Saturated zone.
				10			

Continued Next Page

GENERAL NOTES

Begin Drilling 11/18/02 Complete Drilling 11/18/02
Drilling Contractor Mid America Drill Rig Not Applicable
Driller NA Logged By T Freudenrich Reviewed By
Drilling Method Geoprobe

WATER LEVEL DATA

While Drilling
At Completion of Drilling
Time After Drilling
Depth to Water

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

BORING LOG

Versar INC.

Client: US Navy
Project: supply side landfill
Location:

Boring No. GP2
Surface Elevation:
Job No. 1106840003002
Sheet 2 of 2

SAMPLE No.	Type	Rec (ft.)	PID (ppm)	Depth (ft.)	Profile	VISUAL DESCRIPTION	REMARKS
				15			
						EOB at 16 feet	Water Set the gas probe at 16 ft and in daily cover. CH_4 = 32.6 CO_2 = 21.6 O_2 = 20.2 VP = -0.1
				20			

GENERAL NOTES

Begin Drilling 11/18/02 Complete Drilling 11/18/02
Drilling Contractor Mid America Drill Rig Not Applicable
Driller NA Logged By T Freudenrich Reviewed By
Drilling Method Geoprobe

WATER LEVEL DATA

While Drilling
At Completion of Drilling
Time After Drilling
Depth to Water

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

BORING LOG

Versar INC.

Client: US Navy
Project: supply side landfill
Location:

Boring No. GP3
Surface Elevation:
Job No. 1106840003002
Sheet 1 of 1

SAMPLE No.	Type	Rec (ft.)	PID (ppm)	Depth (ft.)	Profile	VISUAL DESCRIPTION	REMARKS
						Topsoil	
						Silty CLAY (CL) with little gravel (Fill).	w=13.3%
						Organic stained silty CLAY (CL) with isolated waste inclusions.	
				5			Saturated
						EOB at 8 feet	Install GeoProbe continuous sample to 8 ft. BSG, and set gas probe at base of run with daily cover material. CH_4 = 67.3 CO_2 = 37.9 O_2 = 0.2 VP = 28.9
				10			

GENERAL NOTES

Begin Drilling 11/18/02 Complete Drilling 11/18/02
Drilling Contractor Mid America Drill Rig Not Applicable
Driller NA Logged By T Freudenrich Reviewed By
Drilling Method Geoprobe

WATER LEVEL DATA

While Drilling
At Completion of Drilling
Time After Drilling
Depth to Water

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

BORING LOG

Versar INC.

Client: US Navy
Project: supply side landfill
Location:

Boring No. GP4
Surface Elevation:
Job No. 1106840003002
Sheet 1 of 1

SAMPLE No.	Type	Rec (ft.)	PID (ppm)	Depth (ft.)	Profile	VISUAL DESCRIPTION	REMARKS
						Topsoil	
						Silty CLAY (CL) with gravel (Fill).	Shelby tube at 1 to 1.5 ft. hit gravel. w=15.7% LL=34, PL=16, PI=18
				5		Interbedded silty CLAY (CL) and crushed limestone. at 4.5ft. a transition into interbeded organic material becomes present (Fill).	w=8.3% Wet
						Waste matrix mixed in with organic stained silty clay.	Set gas probe @ 6 ft. BSG. CH_4 = 62.2 CO_2 = 34.6 O_2 = 14.6
				10		EOB at 8 feet	Watertable at 8 ft.

GENERAL NOTES

Begin Drilling 11/18/02 Complete Drilling 11/18/02
Drilling Contractor Mid America Drill Rig Not Applicable
Driller NA Logged By T Freudenrich Reviewed By
Drilling Method Geoprobe

WATER LEVEL DATA

While Drilling
At Completion of Drilling
Time After Drilling
Depth to Water

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

BORING LOG

Versar INC.

Client: US Navy
Project: supply side landfill
Location:

Boring No. GP5
Surface Elevation:
Job No. 1106840003002
Sheet 1 of 1

SAMPLE No.	Type	Rec (ft.)	PID (ppm)	Depth (ft.)	Profile	VISUAL DESCRIPTION	REMARKS
						Topsoil	
						Silty CLAY (CL) with gravel (Fill).	
						Crushed limestone and silty clay (Fill).	w=17.2%
						Refuse/waste	
				5		EOB at 5 feet	Set gas probe at 5 ft.: CH_4 = 67.3 CO_2 = 32.1 O_2 = 0.7 VP = -0.2
				10			

GENERAL NOTES

Begin Drilling 11/18/02 Complete Drilling 11/18/02
Drilling Contractor Mid America Drill Rig Not Applicable
Driller NA Logged By T Freudenrich Reviewed By
Drilling Method Geoprobe

WATER LEVEL DATA

While Drilling
At Completion of Drilling
Time After Drilling
Depth to Water

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

BORING LOG

Versar INC.

Client: US Navy
Project: supply side landfill
Location:

Boring No. GP6
Surface Elevation:
Job No. 1106840003002
Sheet 1 of 1

SAMPLE No.	Type	Rec (ft.)	PID (ppm)	Depth (ft.)	Profile	VISUAL DESCRIPTION	REMARKS
						Topsoil/Clay and Sand with gravel (Fill).	
						Silty CLAY (CL) with some gravel (Fill).	Shelby tube: 2 to 3.5 ft. w=20.1% LL=37, PL=18, PI=19
				5		Waste matrix with stained silty clay.	
						EOB at 8 feet	Set gas probe at 8 ft: CH_4 = 0.3 CO_2 = 0.4 O_2 = 19.8 VP = 0.1
				10			

GENERAL NOTES

Begin Drilling 11/19/02 Complete Drilling 11/19/02
Drilling Contractor Mid America Drill Rig Not Applicable
Driller NA Logged By T Freudenrich Reviewed By
Drilling Method Geoprobe

WATER LEVEL DATA

While Drilling
At Completion of Drilling
Time After Drilling
Depth to Water

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

BORING LOG

Versar INC.

Client: US Navy
Project: supply side landfill
Location:

Boring No. GP7
Surface Elevation:
Job No. 1106840003002
Sheet 1 of 1

SAMPLE No.	Type	Rec (ft.)	PID (ppm)	Depth (ft.)	Profile	VISUAL DESCRIPTION	REMARKS
						Topsoil	
						Silty CLAY (CL) with gravel (Fill).	w=15.1%
				5		Organic stained silty CLAY (CL) (Fill).	w=22.4% LL=40, PL=20, PI=20 Set gas probe to 6 ft. BSG: CH_4 = 6.1 CO_2 = 3.4 O_2= 18.8 VP = 0.7
						EOB at 8 feet	
				10			

GENERAL NOTES

Begin Drilling 11/19/02 Complete Drilling 11/19/02
Drilling Contractor Mid America Drill Rig Not Applicable
Driller NA Logged By T Freudenrich Reviewed By
Drilling Method Geoprobe

WATER LEVEL DATA

While Drilling
At Completion of Drilling
Time After Drilling
Depth to Water

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

BORING LOG

Versar INC.

Client: US Navy
Project: supply side landfill
Location:

Boring No. GP8
Surface Elevation:
Job No. 1106840003002
Sheet 1 of 1

SAMPLE No.	Type	Rec (ft.)	PID (ppm)	Depth (ft.)	Profile	VISUAL DESCRIPTION	REMARKS
						Interbedded topsoil and crushed limestone (Fill).	
						Silty CLAY (CL) with gravel (Fill).	w=21.0% LL=40, PL=19, PI=21
						Crushed limestone (Fill).	Wet
				5		Organic stained sandy-silty CLAY (CL) (Fill).	w=7.3% Set gas probe at 6 ft.: CH_4 = 69.3 CO_2 =29.4 O_2 = 0.6 VP = 0.6
						EOB at 8 feet	
				10			

GENERAL NOTES

Begin Drilling 11/19/02 Complete Drilling 11/19/02
Drilling Contractor Mid America Drill Rig Not Applicable
Driller NA Logged By T Freudenrich Reviewed By
Drilling Method Geoprobe

WATER LEVEL DATA

While Drilling
At Completion of Drilling
Time After Drilling
Depth to Water

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

BORING LOG

Versar INC.

Client: US Navy
Project: supply side landfill
Location:

Boring No. GP9
Surface Elevation:
Job No. 1106840003002
Sheet 1 of 1

SAMPLE No.	Type	Rec (ft.)	PID (ppm)	Depth (ft.)	Profile	VISUAL DESCRIPTION	REMARKS
						Topsoil	
						Silty CLAY (CL) (Fill).	
				5		Till, yellow/brown CLAY (CL) with gray silt varves.	Set gas probe at 3.5 ft, just above saturation zone CO_4 = 0.4 CO_2 = 1.0 O_2 = 19.4 VP = 0.4
						EOB at 8 feet	No refuse observed.
				10			

GENERAL NOTES

Begin Drilling 11/19/02 Complete Drilling 11/19/02
Drilling Contractor Mid America Drill Rig Not Applicable
Driller NA Logged By T Freudenrich Reviewed By
Drilling Method Geoprobe

WATER LEVEL DATA

While Drilling
At Completion of Drilling
Time After Drilling
Depth to Water

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

BORING LOG

Versar INC.

Client: US Navy
Project: supply side landfill
Location:

Boring No. GP10
Surface Elevation:
Job No. 1106840003002
Sheet 1 of 1

SAMPLE No.	Type	Rec (ft.)	PID (ppm)	Depth (ft.)	Profile	VISUAL DESCRIPTION	REMARKS
						Refuse to surface, wet.	Set gas probe at 2 ft.: CH_4 = 64.1 CO_2 =29.3 O_2 = 1.8 VP = 0.5
				5			
		4				EOB at 6 feet	
				10			

GENERAL NOTES

egin Drilling 11/19/02 Complete Drilling 11/19/02
Drilling Contractor Mid America Drill Rig Not Applicable
Driller NA Logged By T Freudenrich Reviewed By
Drilling Method Geoprobe

WATER LEVEL DATA

While Drilling
At Completion of Drilling
Time After Drilling
Depth to Water

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

BORING LOG

Versar INC.

Client: US Navy
Project: supply side landfill
Location:

Boring No. GP11
Surface Elevation:
Job No. 1106840003002
Sheet 1 of 2

SAMPLE No.	Type	Rec (ft.)	PID (ppm)	Depth (ft.)	Profile	VISUAL DESCRIPTION	REMARKS
						Clay and Sand with gravel (Fill)	
						Gravelly silty CLAY (CL) (Fill).	w=15.2%
				5		Organic stained silty clay interbedded with layers of gravelly silty clay (Fill).	
				10		Organic stained silty CLAY (CL) (Fill).	Set gas probe at 8.5 ft. CO_4 = 67.1 CO_2 = 37.5 O_2 = 0.0 VP = -0.2 Wet

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GENERAL NOTES

Begin Drilling 11/19/02 Complete Drilling 11/19/02
Drilling Contractor Mid America Drill Rig Not Applicable
Driller NA Logged By T Freudenrich Reviewed By
Drilling Method Geoprobe

WATER LEVEL DATA

While Drilling
At Completion of Drilling
Time After Drilling
Depth to Water

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

BORING LOG

Versar INC.

Client: US Navy
Project: supply side landfill
Location:

Boring No. GP11
Surface Elevation:
Job No. 1106840003002
Sheet 2 of 2

SAMPLE No.	Type	Rec (ft.)	PID (ppm)	Depth (ft.)	Profile	VISUAL DESCRIPTION	REMARKS
						Gray CLAY (CL). EOB at 12 feet	No refuse observed.
				15			
				20			

GENERAL NOTES

egin Drilling 11/19/02 Complete Drilling 11/19/02
Drilling Contractor Mid America Drill Rig Not Applicable
Driller NA Logged By T Freudenrich Reviewed By
Drilling Method Geoprobe

WATER LEVEL DATA

While Drilling
At Completion of Drilling
Time After Drilling
Depth to Water

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

BORING LOG

Versar INC.

Client: US Navy
Project: supply side landfill
Location:

Boring No. GP12
Surface Elevation:
Job No. 1106840003002
Sheet 1 of 2

SAMPLE No.	Type	Rec (ft.)	PID (ppm)	Depth (ft.)	Profile	VISUAL DESCRIPTION	REMARKS
						Clay and Sand with gravel grading into silty CLAY with gravel (CL) (Fill).	w=15.6%
							Wet
						Interbedded organic stained silty CLAY (CL) with gravel and sand (Fill).	
				5			w=17.1%
						Organic stained silty CLAY (CL) (Fill).	
				10			

Continued Next Page

GENERAL NOTES

Begin Drilling 11/19/02 Complete Drilling 11/19/02
Drilling Contractor Mid America Drill Rig Not Applicable
Driller NA Logged By T Freudenrich Reviewed By
Drilling Method Geoprobe

WATER LEVEL DATA

While Drilling
At Completion of Drilling
Time After Drilling
Depth to Water

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

BORING LOG

Versar INC.

Client: US Navy
Project: supply side landfill
Location:

Boring No. GP12
Surface Elevation:
Job No. 1106840003002
Sheet 2 of 2

SAMPLE No.	Type	Rec (ft.)	PID (ppm)	Depth (ft.)	Profile	VISUAL DESCRIPTION	REMARKS
							Set gas probe at 12 ft.
							CH_4 = 5.6
							CO_2 = 7.4
						Gray silty CLAY (CL).	O_2 = 14.1
							VP = -0.2
				15			
						EOB at 18.5 feet	
				20			

GENERAL NOTES

egin Drilling 11/19/02 Complete Drilling 11/19/02
Drilling Contractor Mid America Drill Rig Not Applicable
Driller NA Logged By T Freudenrich Reviewed By
Drilling Method Geoprobe

WATER LEVEL DATA

While Drilling
At Completion of Drilling
Time After Drilling
Depth to Water

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

BORING LOG

Versar INC.

Client: US Navy
Project: supply side landfill
Location:

Boring No. GP13
Surface Elevation:
Job No. 1106840003002
Sheet 1 of 1

SAMPLE No.	Type	Rec (ft.)	PID (ppm)	Depth (ft.)	Profile	VISUAL DESCRIPTION	REMARKS
		1				Clay and Sand with gravel (Fill).	
		0.16				Silty CLAY (CL) with gravel (Fill).	Shelby tube at 3 to 5 ft. w=17.7%
		0.58		5		Silty CLAY (CL) with gravel, seams of silty CLAY (CL) with water (Fill).	Wet
						Refuse.	Set gas probe at 7 ft. just above waste. CH_4 = 3.8 CO_2 = 2.8 O_2 = 18.5 VP = -0.2
				10		EOB at 8 feet	

GENERAL NOTES

Begin Drilling: 11/19/02 Complete Drilling: 11/19/02
Drilling Contractor: Mid America Drill Rig: Not Applicable
Driller: NA Logged By: T Freudenrich Reviewed By:
Drilling Method: Geoprobe

WATER LEVEL DATA

While Drilling:
At Completion of Drilling:
Time After Drilling:
Depth to Water:

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

BORING LOG

Versar INC.

Client: US Navy
Project: supply side landfill
Location:

Boring No. GP14
Surface Elevation:
Job No. 1106840003002
Sheet 1 of 1

SAMPLE No.	Type	Rec (ft.)	PID (ppm)	Depth (ft.)	Profile	VISUAL DESCRIPTION	REMARKS
		1				Topsoil.	
						Brown silty CLAY (CL) with gravel (Fill).	w=15.4% LL=35, PL=16, PI=19 Wet
				5		Silty CLAY (CL) with crushed stone (Fill).	w=20.6% LL=35, PL=8, PI=27
						Refuse.	Set gas probe at 5.5 ft.: CH_4 = 63.4 CO_2 = 41.2 O_2 = 0.0 VP = 0.3
						Gravelly silty CLAY (CL).	
						EOB at 8 feet	
				10			

GENERAL NOTES

Begin Drilling: 11/19/02 Complete Drilling: 11/19/02
Drilling Contractor: Mid America Drill Rig: Not Applicable
Driller: NA Logged By: T Freudenrich Reviewed By:
Drilling Method: Geoprobe

WATER LEVEL DATA

While Drilling:
At Completion of Drilling:
Time After Drilling:
Depth to Water:

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

BORING LOG

Versar INC.

Client: US Navy
Project: supply side landfill
Location:

Boring No. GP15
Surface Elevation:
Job No. 1106840003002
Sheet 1 of 1

SAMPLE No.	Type	Rec (ft.)	PID (ppm)	Depth (ft.)	Profile	VISUAL DESCRIPTION	REMARKS
						Topsoil	
						Silty CLAY (CL) with gravel (Fill).	w=15.9%
							Shelby tube at 2 to 4 ft. w=15.9% LL=34, PL=15, PI=19
						Silty CLAY (CL) with small amounts of sand and gravel (Fill).	
							Wet
						Organic stained silty CLAY (CL) with small amounts of crushed limestone (Fill).	
				5			
							Set gas probe at 7 ft.: CH_4 = 22.3 CO_2 = 10.6 O_2 = 13.4 VP = -0.4
						EOB at 8 feet	
				10			

GENERAL NOTES

Begin Drilling 11/19/02 Complete Drilling 11/19/02
Drilling Contractor Mid America Drill Rig Not Applicable
Driller NA Logged By T Freudenrich Reviewed By
Drilling Method Geoprobe

WATER LEVEL DATA

While Drilling
At Completion of Drilling
Time After Drilling
Depth to Water

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

BORING LOG

Versar INC.

Client: US Navy
Project: supply side landfill
Location:

Boring No. GP16
Surface Elevation:
Job No. 1106840003002
Sheet 1 of 3

SAMPLE No.	Type	Rec (ft.)	PID (ppm)	Depth (ft.)	Profile	VISUAL DESCRIPTION	REMARKS
		0.5				Clay and Sand with gravel (Fill).	
		0					
		0.66		5		Topsoil	
		0.83				Silty CLAY (CL) with some gravel and isolated organic stains (Fill).	
				10			

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GENERAL NOTES

Begin Drilling 11/20/02 Complete Drilling 11/20/02
Drilling Contractor Mid America Drill Rig Not Applicable
Driller NA Logged By T Freudenrich Reviewed By
Drilling Method Geoprobe

WATER LEVEL DATA

While Drilling
At Completion of Drilling
Time After Drilling
Depth to Water

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

BORING LOG

Versar INC.

Client: US Navy
Project: supply side landfill
Location:

Boring No. GP16
Surface Elevation:
Job No. 1106840003002
Sheet 2 of 3

SAMPLE No.	Type	Rec (ft.)	PID (ppm)	Depth (ft.)	Profile	VISUAL DESCRIPTION	REMARKS
						Waste matrix.	set gas probe at 12 ft. BSG: CH_4 = 0.5 CO_2 = 4.0 O_2 = 11.2 VP = 0.4
				15			
				20			

Continued Next Page

GENERAL NOTES

Begin Drilling 11/20/02 Complete Drilling 11/20/02
Drilling Contractor Mid America Drill Rig Not Applicable
Driller NA Logged By T Freudenrich Reviewed By
Drilling Method Geoprobe

WATER LEVEL DATA

While Drilling
At Completion of Drilling
Time After Drilling
Depth to Water

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

BORING LOG

Versar INC.

Client: US Navy
Project: supply side landfill
Location:

Boring No. GP16
Surface Elevation:
Job No. 1106840003002
Sheet 3 of 3

SAMPLE No.	Type	Rec (ft.)	PID (ppm)	Depth (ft.)	Profile	VISUAL DESCRIPTION	REMARKS
						EOB at 20 feet	
				25			
				30			

GENERAL NOTES

egin Drilling 11/20/02 Complete Drilling 11/20/02
Drilling Contractor Mid America Drill Rig Not Applicable
Driller NA Logged By T Freudenrich Reviewed By
Drilling Method Geoprobe

WATER LEVEL DATA

While Drilling
At Completion of Drilling
Time After Drilling
Depth to Water

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

BORING LOG

Versar INC.

Client: US Navy
Project: supply side landfill
Location:

Boring No. GP17
Surface Elevation:
Job No. 1106840003002
Sheet 1 of 1

SAMPLE No.	Type	Rec (ft.)	PID (ppm)	Depth (ft.)	Profile	VISUAL DESCRIPTION	REMARKS
						Topsoil	
						Silty CLAY (CL) with gravel (Fill).	
						Refuse.	Wet
				5		EOB at 5 feet	Set gas probe at 5 ft. BSG: CH_4 = 66.5 CO_2 = 40.0 O_2 = 0.0 VP = 0.2
				10			

GENERAL NOTES

Begin Drilling 11/20/02 Complete Drilling 11/20/02
Drilling Contractor Mid America Drill Rig Not Applicable
Driller NA Logged By T Freudenrich Reviewed By
Drilling Method Geoprobe

WATER LEVEL DATA

While Drilling
At Completion of Drilling
Time After Drilling
Depth to Water

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

BORING LOG

Versar INC.

Client: US Navy
Project: supply side landfill
Location:

Boring No. GP18
Surface Elevation:
Job No. 1106840003002
Sheet 1 of 1

SAMPLE No.	Type	Rec (ft.)	PID (ppm)	Depth (ft.)	Profile	VISUAL DESCRIPTION	REMARKS
						Silty CLAY (CL) with gravel (Fill).	
						Organic stained silty CLAY (CL) (Fill).	w=15.8% Wet
						Refuse.	Set gas probe at 30 in. CH_4 = 34.2 CO_2 = 12.8 O_2 = 11.9 VP = 0.1
						EOB at 4 feet	
				5			
				10			

GENERAL NOTES

Begin Drilling 11/20/02 Complete Drilling 11/20/02
Drilling Contractor Mid America Drill Rig Not Applicable
Driller NA Logged By T Freudenrich Reviewed By
Drilling Method Geoprobe

WATER LEVEL DATA

While Drilling
At Completion of Drilling
Time After Drilling
Depth to Water

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

BORING LOG

Versar INC.

Client: US Navy
Project: supply side landfill
Location:

Boring No. GP19
Surface Elevation:
Job No. 1106840003002
Sheet 1 of 1

SAMPLE No.	Type	Rec (ft.)	PID (ppm)	Depth (ft.)	Profile	VISUAL DESCRIPTION	REMARKS
						Silty CLAY (CL) with gravel (Fill).	Attempted Shelby tube at 2 to 3.5 ft., rejected by rock.
							w=13.3% LL=31, PL=16, PI=15 Wet
						Organic silty CLAY (CL) (Fill).	
				5		Refuse.	Set gas probe at 5 ft. BSG. CH_4 = 25.1 CO_2 = 8.7 O_2 = 16.1 VP = 0.2
						EOB at 8 feet	
				10			

GENERAL NOTES

Begin Drilling 11/20/02 Complete Drilling 11/20/02
Drilling Contractor Mid America Drill Rig Not Applicable
Driller NA Logged By T Freudenrich Reviewed By
Drilling Method Geoprobe

WATER LEVEL DATA

While Drilling
At Completion of Drilling
Time After Drilling
Depth to Water

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

BORING LOG

Versar INC.

Client: US Navy
Project: supply side landfill
Location:

Boring No. GP20
Surface Elevation:
Job No. 1106840003002
Sheet 1 of 1

SAMPLE No.	Type	Rec (ft.)	PID (ppm)	Depth (ft.)	Profile	VISUAL DESCRIPTION	REMARKS
						Topsoil.	
						Mixed silty CLAY (CL) with construction rubble (asphalt) (Fill).	
				5		Gravelly CLAY (CL) with crushed limestone and construction debris (Fill).	Set gas probe at 4.5 ft. BSG. CH_4 = 7.1 CO_2 = 4.2 O_2 = 15.2 VP = 0.1
						EOB at 8 feet	
				10			

GENERAL NOTES

egin Drilling 11/20/02 Complete Drilling 11/20/02
Drilling Contractor Mid America Drill Rig Not Applicable
Driller NA Logged By T Freudenrich Reviewed By
Drilling Method Geoprobe

WATER LEVEL DATA

While Drilling
At Completion of Drilling
Time After Drilling
Depth to Water

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

BORING LOG

Versar INC.

Client: US Navy
Project: supply side landfill
Location:

Boring No. GP21
Surface Elevation:
Job No. 1106840003002
Sheet 1 of 1

SAMPLE No.	Type	Rec (ft.)	PID (ppm)	Depth (ft.)	Profile	VISUAL DESCRIPTION	REMARKS
						Topsoil	
						Silty CLAY (CL) with some sand and gravel (Fill).	w=18.7%
						Refuse. Between 4.5 to 5.5 ft. lens of soft refuse.	Wet
				5			Set gas probe at 5.5 ft. BSG. CH_4 = 64.1 CO_2= 41.2 O_2 = 0.8 VP 0.1
						EOB at 8 feet	
				10			

GENERAL NOTES

egin Drilling 11/20/02 Complete Drilling 11/20/02
Drilling Contractor Mid America Drill Rig Not Applicable
Driller NA Logged By T Freudenrich Reviewed By
Drilling Method Geoprobe

WATER LEVEL DATA

While Drilling
At Completion of Drilling
Time After Drilling
Depth to Water

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

BORING LOG

Versar INC.

Client: US Navy
Project: supply side landfill
Location:

Boring No. GP22
Surface Elevation:
Job No. 1106840003002
Sheet 1 of 1

SAMPLE No.	Type	Rec (ft.)	PID (ppm)	Depth (ft.)	Profile	VISUAL DESCRIPTION	REMARKS
						Silty CLAY (CL) with some sand and gravel (Fill).	
							w=17.0% Wet
						Refuse.	Set gas probe at 2 ft. BSG CH_4 = 48.1 CO_2 = 7.1 O_2 = 13.9 VP = -0.1
						EOB at 4 feet	
				5			
				10			

GENERAL NOTES

Begin Drilling 11/20/02 Complete Drilling 11/20/02
Drilling Contractor Mid America Drill Rig Not Applicable
Driller NA Logged By T Freudenrich Reviewed By
Drilling Method Geoprobe

WATER LEVEL DATA

While Drilling
At Completion of Drilling
Time After Drilling
Depth to Water

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

BORING LOG

Versar INC.

Client: US Navy
Project: supply side landfill
Location:

Boring No. GP23
Surface Elevation
Job No. 1106840003002
Sheet 1 of 1

SAMPLE No.	Type	Rec (ft.)	PID (ppm)	Depth (ft.)	Profile	VISUAL DESCRIPTION	REMARKS
						Clay and Sand with gravel (Fill).	
						Crushed limestone (Fill).	
						Gravelly silty CLAY (CL) (Fill).	
						Silty CLAY (CL) with some gravel (Fill).	
						Crushed limestone (Fill).	
				5		Silty CLAY (CL) with some coarse sand (Fill).	w=17.5%
						Refuse.	
						EOB at 8 feet	Install GeoProbe continuous soil sample to 8 ft. BSG, set gas probe at 8 ft. near landfill vent. CH_4 = 7.1 CO_2 = 1.6 O_2 = 13.6 VP -0.1
				10			

GENERAL NOTES

Begin Drilling 11/20/02 Complete Drilling 11/20/02
Drilling Contractor Mid America Drill Rig Not Applicable
Driller NA Logged By T Freudenrich Reviewed By
Drilling Method Geoprobe

WATER LEVEL DATA

While Drilling
At Completion of Drilling
Time After Drilling
Depth to Water

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

BORING LOG

Versar INC.

Client: US Navy
Project: supply side landfill
Location:

Boring No. GP24
Surface Elevation:
Job No. 1106840003002
Sheet 1 of 1

SAMPLE No.	Type	Rec (ft.)	PID (ppm)	Depth (ft.)	Profile	VISUAL DESCRIPTION	REMARKS
						Vegetation and soil mix.	
						Topsoil.	
						Silty CLAY (CL) (Fill).	
						Crushed limestone (Fill).	
						Crushed limestone and silty CLAY (CL) mix (Fill).	
				5		Green/Gray silty CLAY (CL) with decomposing organics (swamp sediments).	Set gas probe at 6.5 ft. CH_4 = 37.2 CO_2 = 18.6 O_2 = 9.1 VP = 0.1
						Gray silty CLAY (CL).	
						EOB at 8 feet	
				10			

GENERAL NOTES

Begin Drilling 11/20/02 Complete Drilling 11/20/02
Drilling Contractor Mid America Drill Rig Not Applicable
Driller NA Logged By T Freudenrich Reviewed By
Drilling Method Geoprobe

WATER LEVEL DATA

While Drilling
At Completion of Drilling
Time After Drilling
Depth to Water

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

BORING LOG

Versar INC.

Client: US Navy
Project: supply side landfill
Location:

Boring No. GP25
Surface Elevation:
Job No. 1106840003002
Sheet 1 of 1

SAMPLE No.	Type	Rec (ft.)	PID (ppm)	Depth (ft.)	Profile	VISUAL DESCRIPTION	REMARKS
						Topsoil becoming mixed with refuse.	
						Gray silty CLAY (CL).	Set gas probe at 14 in. depth. CH_4 = 27.6 CO_2 = 8.8 O_2 = 14.6 VP = 0.1
						EOB at 4 feet	
				5			
				10			

GENERAL NOTES

Begin Drilling 11/20/02 Complete Drilling 11/20/02
Drilling Contractor Mid America Drill Rig Not Applicable
Driller NA Logged By T Freudenrich Reviewed By
Drilling Method Geoprobe

WATER LEVEL DATA

While Drilling
At Completion of Drilling
Time After Drilling
Depth to Water

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

BORING LOG

Versar INC.

Client: US Navy
Project: supply side landfill
Location:

Boring No. GP26
Surface Elevation:
Job No. 1106840003002
Sheet 1 of 1

SAMPLE No.	Type	Rec (ft.)	PID (ppm)	Depth (ft.)	Profile	VISUAL DESCRIPTION	REMARKS
						Topsoil.	
						Silty CLAY (CL) with some gravel (Fill).	
						Organic stained silty CLAY (CL) (Fill).	Set gas Probe at 3 ft. BSG. CH_4 = 3.4 CO_2 = 1.9 O_2 = 18.6 VP = 0.0
				5		Gray silty CLAY (CL).	
						EOB at 8 feet	
				10			

GENERAL NOTES

egin Drilling 11/21/02 Complete Drilling 11/21/02
Drilling Contractor Mid America Drill Rig Not Applicable
Driller NA Logged By T Freudenrich Reviewed By
Drilling Method Geoprobe

WATER LEVEL DATA

While Drilling
At Completion of Drilling
Time After Drilling
Depth to Water

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

BORING LOG

Versar INC.

Client: US Navy
Project: supply side landfill
Location:

Boring No. GP27
Surface Elevation:
Job No. 1106840003002
Sheet 1 of 1

SAMPLE No.	Type	Rec (ft.)	PID (ppm)	Depth (ft.)	Profile	VISUAL DESCRIPTION	REMARKS
						Topsoil.	
						Gray silty CLAY (CL).	Set gas probe at 2nd location: CH_4 = 0.0 CO_2 = 0.1 O_2 = 20.1 VP = 0.2
						EOB at 4 feet	
				5			
				10			

GENERAL NOTES

Begin Drilling 11/21/02 Complete Drilling 11/21/02
Drilling Contractor Mid America Drill Rig Not Applicable
Driller NA Logged By T Freudenrich Reviewed By
Drilling Method Geoprobe

WATER LEVEL DATA

While Drilling
At Completion of Drilling
Time After Drilling
Depth to Water

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

BORING LOG

Versar INC.

Client: US Navy
Project: supply side landfill
Location:

Boring No. GP28
Surface Elevation:
Job No. 1106840003002
Sheet 1 of 1

SAMPLE No.	Type	Rec (ft.)	PID (ppm)	Depth (ft.)	Profile	VISUAL DESCRIPTION	REMARKS
						Topsoil.	
						Gray silty CLAY (CL).	Set gas probe at 3 ft. CH_4 = 0.0 CO_2 = 0.4 O_2 = 20.1 VP = 0.0
						EOB at 4 feet	
				5			
				10			

GENERAL NOTES

Begin Drilling 11/22/02 Complete Drilling 11/22/02
Drilling Contractor Mid America Drill Rig Not Applicable
Driller NA Logged By T Freudenrich Reviewed By
Drilling Method Geoprobe

WATER LEVEL DATA

While Drilling
At Completion of Drilling
Time After Drilling
Depth to Water

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

BORING LOG

Versar INC.

Client: US Navy
Project: supply side landfill
Location:

Boring No. GP29
Surface Elevation:
Job No. 1106840003002
Sheet 1 of 1

SAMPLE No.	Type	Rec (ft.)	PID (ppm)	Depth (ft.)	Profile	VISUAL DESCRIPTION	REMARKS
						Topsoil.	
						Sandy loam.	
						Organic stained CLAY (CL) with little refuse.	
						Organic stained clay with some sand and gravel.	Set gas Probe at 2.5 ft.: CH_4 = 0.0 CO_2 = 3.3 O_2 = 18.2
				5		Gray silty CLAY (CL).	
						EOB at 8 feet	
				10			

GENERAL NOTES

Begin Drilling 11/22/02 Complete Drilling 11/22/02
Drilling Contractor Mid America Drill Rig Not Applicable
Driller NA Logged By T Freudenrich Reviewed By
Drilling Method Geoprobe

WATER LEVEL DATA

While Drilling
At Completion of Drilling
Time After Drilling
Depth to Water

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

BORING LOG

Versar INC.

Client: US Navy
Project: supply side landfill
Location:

Boring No. GP30
Surface Elevation:
Job No. 1106840003002
Sheet 1 of 1

SAMPLE No.	Type	Rec (ft.)	PID (ppm)	Depth (ft.)	Profile	VISUAL DESCRIPTION	REMARKS
						Topsoil.	
						CLAY (CL) with sand and gravel inclusions.	
						Topsoil.	
						CLAY (CL) with little sand and gravel.	
				5		Topsoil.	Set gas probe at 5 ft. depth. CH_4 = 0.0 CO_2 = 2.5 O_2 = 19.3
						Gray silty CLAY (CL).	
						EOB at 8 feet	
				10			

GENERAL NOTES

Begin Drilling 11/22/02 Complete Drilling 11/22/02
Drilling Contractor Mid America Drill Rig Not Applicable
Driller NA Logged By T Freudenrich Reviewed By
Drilling Method Geoprobe

WATER LEVEL DATA

While Drilling
At Completion of Drilling
Time After Drilling
Depth to Water

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

BORING LOG

Versar INC.

Client: US Navy
Project: supply side landfill
Location:

Boring No. GP31
Surface Elevation:
Job No. 1106840003002
Sheet 1 of 1

SAMPLE No.	Type	Rec (ft.)	PID (ppm)	Depth (ft.)	Profile	VISUAL DESCRIPTION	REMARKS
						Silty CLAY (CL) (Fill).	
						Industrial grit, red (Fill).	
						Gravelly CLAY (CL).	
							Set gas probe at 2.5 ft.: CH_4 = 0.0 CO_2= 0.0 O_2 = 20.5 VP = 0.1
				5		Void, Drain tile?	
						Silty CLAY (CL).	
						EOB at 8 feet	
				10			

GENERAL NOTES

Begin Drilling 11/22/02 Complete Drilling 11/22/02
Drilling Contractor Mid America Drill Rig Not Applicable
Driller NA Logged By T Freudenrich Reviewed By
Drilling Method Geoprobe

WATER LEVEL DATA

While Drilling
At Completion of Drilling
Time After Drilling
Depth to Water

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

BORING LOG

Versar INC.

Client: US Navy
Project: supply side landfill
Location:

Boring No. GP32
Surface Elevation:
Job No. 1106840003002
Sheet 1 of 1

SAMPLE No.	Type	Rec (ft.)	PID (ppm)	Depth (ft.)	Profile	VISUAL DESCRIPTION	REMARKS
						Silty CLAY (CL) with construction rubble (Fill).	
				5		Organic layer.	Set gas probe at 6 ft. depth. CH_4 = 0.4 CO_2 = 4.6 O_2 = 16.4 VP = 0.0
						Silty CLAY (CL) with gravel (Fill).	
						Blue/gray silty CLAY (CL). EOB at 8 feet	
				10			

GENERAL NOTES

Begin Drilling 11/21/02 Complete Drilling 11/21/02
Drilling Contractor Mid America Drill Rig Not Applicable
Driller NA Logged By T Freudenrich Reviewed By
Drilling Method Geoprobe

WATER LEVEL DATA

While Drilling
At Completion of Drilling
Time After Drilling
Depth to Water

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

BORING LOG

Versar INC.

Client: US Navy
Project: supply side landfill
Location:

Boring No. GP33
Surface Elevation:
Job No. 1106840003002
Sheet 1 of 2

SAMPLE No.	Type	Rec (ft.)	PID (ppm)	Depth (ft.)	Profile	VISUAL DESCRIPTION	REMARKS
						Mixed CLAY (CL) with constuction rubble (Fill).	
				5			
				10			

Continued Next Page

GENERAL NOTES

Begin Drilling 11/21/02 Complete Drilling 11/21/02
Drilling Contractor Mid America Drill Rig Not Applicable
Driller NA Logged By T Freudenrich Reviewed By
Drilling Method Geoprobe

WATER LEVEL DATA

While Drilling
At Completion of Drilling
Time After Drilling
Depth to Water

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

BORING LOG

Versar INC.

Client: US Navy
Project: supply side landfill
Location:

Boring No. GP33
Surface Elevation:
Job No. 1106840003002
Sheet 2 of 2

SAMPLE No.	Type	Rec (ft.)	PID (ppm)	Depth (ft.)	Profile	VISUAL DESCRIPTION	REMARKS
						Organic muck (Fill).	
						Silty CLAY (CL) with gravel (Fill).	
						8 inch seam of industrial grit, red (Fill).	Set gas probe at 13 ft.: CH_4 = 0.7, CO_2 = 0.7, O_2 = 0.5, VP = 0.5
						Organic stained CLAY (CL).	
				15		Silty CLAY (CL) with gravel.	
						EOB at 16 feet	
				20			

GENERAL NOTES

Begin Drilling 11/21/02 Complete Drilling 11/21/02
Drilling Contractor Mid America Drill Rig Not Applicable
Driller NA Logged By T Freudenrich Reviewed By
Drilling Method Geoprobe

WATER LEVEL DATA

While Drilling
At Completion of Drilling
Time After Drilling
Depth to Water

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

BORING LOG

Versar INC.

Client: US Navy
Project: supply side landfill
Location:

Boring No. MW1
Surface Elevation:
Job No. 1106840003002
Sheet 1 of 4

SAMPLE No.	Type	Rec (ft.)	PID (ppm)	Depth (ft.)	Profile	VISUAL DESCRIPTION	REMARKS
						Clay and Sand with gravel (Fill).	
				5		Silty CLAY (CL) with some sand and gravel (Fill).	
				10		Organics and refuse in silty CLAY (CL) daily cover.	

Continued Next Page

GENERAL NOTES

egin Drilling 11/18/02 Complete Drilling 11/18/02
Drilling Contractor Mid America Drill Rig Not Applicable
Driller NA Logged By T Freudenrich Reviewed By
Drilling Method Hollow Stem Auger

WATER LEVEL DATA

While Drilling
At Completion of Drilling
Time After Drilling
Depth to Water

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

BORING LOG

Versar INC.

Client: US Navy
Project: supply side landfill
Location:

Boring No. MW1
Surface Elevation:
Job No. 1106840003002
Sheet 2 of 4

SAMPLE No.	Type	Rec (ft.)	PID (ppm)	Depth (ft.)	Profile	VISUAL DESCRIPTION	REMARKS
				15			Dry
				20		Difficult drilling, foam rubber and metal	

Continued Next Page

GENERAL NOTES

Begin Drilling 11/18/02 Complete Drilling 11/18/02
Drilling Contractor Mid America Drill Rig Not Applicable
Driller NA Logged By T Freudenrich Reviewed By
Drilling Method Hollow Stem Auger

WATER LEVEL DATA

While Drilling
At Completion of Drilling
Time After Drilling
Depth to Water

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

BORING LOG

Versar INC.

Client: US Navy
Project: supply side landfill
Location:

Boring No. MW1
Surface Elevation:
Job No. 1106840003002
Sheet 3 of 4

SAMPLE No.	Type	Rec (ft.)	PID (ppm)	Depth (ft.)	Profile	VISUAL DESCRIPTION	REMARKS
				25			Elevated methane discharge (LEL>10%)
				30			

Continued Next Page

GENERAL NOTES

Begin Drilling 11/18/02 Complete Drilling 11/18/02
Drilling Contractor Mid America Drill Rig Not Applicable
Driller NA Logged By T Freudenrich Reviewed By
Drilling Method Hollow Stem Auger

WATER LEVEL DATA

While Drilling
At Completion of Drilling
Time After Drilling
Depth to Water

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

BORING LOG

Versar INC.

Client: US Navy
Project: supply side landfill
Location:

Boring No. MW1
Surface Elevation:
Job No. 1106840003002
Sheet 4 of 4

SAMPLE No.	Type	Rec (ft.)	PID (ppm)	Depth (ft.)	Profile	VISUAL DESCRIPTION	REMARKS
						EOB at 32 feet Set temporary monitoring well, 2" diameter, 5' screen, 32' to 27' BGS.	
				35			
				40			

GENERAL NOTES

Begin Drilling 11/18/02 Complete Drilling 11/18/02
Drilling Contractor Mid America Drill Rig Not Applicable
Driller NA Logged By T Freudenrich Reviewed By
Drilling Method Hollow Stem Auger

WATER LEVEL DATA

While Drilling
At Completion of Drilling
Time After Drilling
Depth to Water

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

BORING LOG

Versar INC.

Client: US Navy
Project: supply side landfill
Location:

Boring No. MW1X
Surface Elevation:
Job No. 1106840003002
Sheet 1 of 3

SAMPLE No.	Type	Rec (ft.)	PID (ppm)	Depth (ft.)	Profile	VISUAL DESCRIPTION	REMARKS
						Clay and Sand with gravel, loose to firm, dry (Fill)	
				5		Brown silty CLAY (CL) (Fill).	w=16.6% LL=39, PL=17, PI=22
				10		Silty CLAY (CL) with organic mottling, very plastic with varying veins of gray silt and some organic mottling (Fill).	Soft and very moist

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GENERAL NOTES

Begin Drilling 11/14/02 Complete Drilling 11/14/02
Drilling Contractor Mid America Drill Rig Not Applicable
Driller NA Logged By T Freudenrich Reviewed By
Drilling Method Hollow Stem Auger

WATER LEVEL DATA

While Drilling
At Completion of Drilling
Time After Drilling
Depth to Water

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

BORING LOG

Versar INC.

Client: US Navy
Project: supply side landfill
Location:

Boring No. MW1X
Surface Elevation:
Job No. 1106840003002
Sheet 2 of 3

SAMPLE No.	Type	Rec (ft.)	PID (ppm)	Depth (ft.)	Profile	VISUAL DESCRIPTION	REMARKS
							10-14 ft. stiff and dry
				15			After auger was removed below 16 feet caved in
			<6			Refuse, refusal at 25 ft.	Matrix becomes very dry
				20			

Continued Next Page

GENERAL NOTES

Begin Drilling 11/14/02 Complete Drilling 11/14/02
Drilling Contractor Mid America Drill Rig Not Applicable
Driller NA Logged By T Freudenrich Reviewed By
Drilling Method Hollow Stem Auger

WATER LEVEL DATA

While Drilling
At Completion of Drilling
Time After Drilling
Depth to Water

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

BORING LOG

Versar INC.

Client: US Navy
Project: supply side landfill
Location:

Boring No. MW1X
Surface Elevation:
Job No. 1106840003002
Sheet 3 of 3

SAMPLE No.	Type	Rec (ft.)	PID (ppm)	Depth (ft.)	Profile	VISUAL DESCRIPTION	REMARKS
							18-22 ft. dry, no recovery below 22 ft.
							LEL : 10%
				25		EOB at 25 feet , abandoned hole.	Refusal at 25 ft.
				30			

GENERAL NOTES

egin Drilling 11/14/02 Complete Drilling 11/14/02
Drilling Contractor Mid America Drill Rig Not Applicable
Driller NA Logged By T Freudenrich Reviewed By
Drilling Method Hollow Stem Auger

WATER LEVEL DATA

While Drilling
At Completion of Drilling
Time After Drilling
Depth to Water

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

BORING LOG

Versar INC.

Client: US Navy
Project: supply side landfill
Location:

Boring No. MW2
Surface Elevation:
Job No. 1106840003002
Sheet 1 of 4

SAMPLE No.	Type	Rec (ft.)	PID (ppm)	Depth (ft.)	Profile	VISUAL DESCRIPTION	REMARKS
						Loose Clay and Sand with gravel (Fill).	
						Very loose Clay and Sand with gravel (Fill).	Wet
						Very soft topsoil layer	
				5			Moist
						Soft to firm brown silty CLAY (CL) with some organic lenses (Fill).	
							w=18.2% LL=43, PL=18, PI=25
				10			

Continued Next Page

GENERAL NOTES

Begin Drilling 11/14/02 Complete Drilling 11/15/02
Drilling Contractor Mid America Drill Rig Not Applicable
Driller NA Logged By T Freudenrich Reviewed By
Drilling Method Hollow Stem Auger

WATER LEVEL DATA

While Drilling
At Completion of Drilling
Time After Drilling
Depth to Water

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

BORING LOG

Versar INC.

Client: US Navy
Project: supply side landfill
Location:

Boring No. MW2
Surface Elevation:
Job No. 1106840003002
Sheet 2 of 4

SAMPLE No.	Type	Rec (ft.)	PID (ppm)	Depth (ft.)	Profile	VISUAL DESCRIPTION	REMARKS
						Waste matrix, clay with refuse, including plastic, wood, metal, poly	Water transition LEL: 0-4% Wet
			2-6	15			
				20			

Continued Next Page

GENERAL NOTES

Begin Drilling 11/14/02 Complete Drilling 11/15/02
Drilling Contractor Mid America Drill Rig Not Applicable
Driller NA Logged By T Freudenrich Reviewed By
Drilling Method Hollow Stem Auger

WATER LEVEL DATA

While Drilling
At Completion of Drilling
Time After Drilling
Depth to Water

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

BORING LOG

Versar INC.

Client: US Navy
Project: supply side landfill
Location:

Boring No. MW2
Surface Elevation:
Job No. 1106840003002
Sheet 3 of 4

SAMPLE No.	Type	Rec (ft.)	PID (ppm)	Depth (ft.)	Profile	VISUAL DESCRIPTION	REMARKS
				25			Wet
				30			

Continued Next Page

GENERAL NOTES

Begin Drilling 11/14/02 Complete Drilling 11/15/02
Drilling Contractor Mid America Drill Rig Not Applicable
Driller NA Logged By T Freudenrich Reviewed By
Drilling Method Hollow Stem Auger

WATER LEVEL DATA

While Drilling
At Completion of Drilling
Time After Drilling
Depth to Water

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

BORING LOG

Versar INC.

Client: US Navy
Project: supply side landfill
Location:

Boring No. MW2
Surface Elevation:
Job No. 1106840003002
Sheet 4 of 4

SAMPLE No.	Type	Rec (ft.)	PID (ppm)	Depth (ft.)	Profile	VISUAL DESCRIPTION	REMARKS
						Silty CLAY (CL), hard, gray. refusal at 32 ft.	w=19.4% LL=39, PL=16, PI=23
						EOB at 32 feet Set temporary monitoring well, 2" diameter, 10' screen, 31' to 21' BGS	Refusal at 32 ft.
				35			
				40			

GENERAL NOTES

egin Drilling 11/14/02 Complete Drilling 11/15/02
Drilling Contractor Mid America Drill Rig Not Applicable
Driller NA Logged By T Freudenrich Reviewed By
Drilling Method Hollow Stem Auger

WATER LEVEL DATA

While Drilling
At Completion of Drilling
Time After Drilling
Depth to Water

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

BORING LOG

Versar INC.

Client: US Navy
Project: supply side landfill
Location:

Boring No. MW3
Surface Elevation:
Job No. 1106840003002
Sheet 1 of 2

SAMPLE No.	Type	Rec (ft.)	PID (ppm)	Depth (ft.)	Profile	VISUAL DESCRIPTION	REMARKS
						CLAY (CL) with gravel (Fill).	w=14.9% LL=37, PL=17, PI=20
						Refuse including paper, metal, plastic, not decomposing. void between 10.5-12 ft.	
				5			
							Dry
				10			

Continued Next Page

GENERAL NOTES

Begin Drilling: 11/15/02 Complete Drilling: 11/15/02
Drilling Contractor: Mid America Drill Rig: Not Applicable
Driller: NA Logged By: T Freudenrich Reviewed By:
Drilling Method: Hollow Stem Auger

WATER LEVEL DATA

While Drilling:
At Completion of Drilling:
Time After Drilling:
Depth to Water:

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

BORING LOG

Versar INC.

Client: US Navy
Project: supply side landfill
Location:

Boring No. MW3
Surface Elevation:
Job No. 1106840003002
Sheet 2 of 2

SAMPLE No.	Type	Rec (ft.)	PID (ppm)	Depth (ft.)	Profile	VISUAL DESCRIPTION	REMARKS
						Layer of dark red/brown medium grit (industrial material).	Oversaturated
				15		EOB at 15.5 feet Below is very stiff moist silty CLAY (CL).	Moist
				20		Set temporary monitoring well, 2" diameter, 10' screen, 15.5' to 5.5' BGS	

GENERAL NOTES

egin Drilling 11/15/02 Complete Drilling 11/15/02
Drilling Contractor Mid America Drill Rig Not Applicable
Driller NA Logged By T Freudenrich Reviewed By
Drilling Method Hollow Stem Auger

WATER LEVEL DATA

While Drilling
At Completion of Drilling
Time After Drilling
Depth to Water

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

BORING LOG

Versar INC.

Client: US Navy
Project: supply side landfill
Location:

Boring No. MW4
Surface Elevation:
Job No. 1106840003002
Sheet 1 of 3

SAMPLE No.	Type	Rec (ft.)	PID (ppm)	Depth (ft.)	Profile	VISUAL DESCRIPTION	REMARKS
						Mixed layers of soft CLAY (CL), gravelly CLAY (CL), GRAVEL (GW), ash/cinders (Fill).	
				5		CLAY (CL) becomes less gravelly and more plastic and stiff/firm	
						CLAY (CL) with slight amounts of gravel and organic lenses. water present at 12 ft. and clay becomes soft	Moist
				10			

Continued Next Page

GENERAL NOTES

Begin Drilling 11/15/02 Complete Drilling 11/15/02
Drilling Contractor Mid America Drill Rig Not Applicable
Driller NA Logged By T Freudenrich Reviewed By
Drilling Method Hollow Stem Auger

WATER LEVEL DATA

While Drilling
At Completion of Drilling
Time After Drilling
Depth to Water

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

BORING LOG

Versar INC.

Client: US Navy
Project: supply side landfill
Location:

Boring No. MW4
Surface Elevation:
Job No. 1106840003002
Sheet 2 of 3

SAMPLE No.	Type	Rec (ft.)	PID (ppm)	Depth (ft.)	Profile	VISUAL DESCRIPTION	REMARKS
							Wet
							Water presents at 12 ft, and clay becomes soft.
				15		Medium dense gray sandy SILT (ML) becoming silty fine SAND (SM) to fine SAND (SP) with increase depth.	
						Silty CLAY (CL), very soft, gray.	Moist
				20			

Continued Next Page

GENERAL NOTES

Begin Drilling 11/15/02 Complete Drilling 11/15/02
Drilling Contractor Mid America Drill Rig Not Applicable
Driller NA Logged By T Freudenrich Reviewed By
Drilling Method Hollow Stem Auger

WATER LEVEL DATA

While Drilling
At Completion of Drilling
Time After Drilling
Depth to Water

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

BORING LOG

Versar INC.

Client: US Navy
Project: supply side landfill
Location:

Boring No. MW4
Surface Elevation:
Job No. 1106840003002
Sheet 3 of 3

SAMPLE No.	Type	Rec (ft.)	PID (ppm)	Depth (ft.)	Profile	VISUAL DESCRIPTION	REMARKS
						EOB at 20 feet Set temporary monitoring well, 2" diameter, 10' screen, 22' to 12' BGS	
				25			
				30			

GENERAL NOTES

egin Drilling 11/15/02 Complete Drilling 11/15/02
Drilling Contractor Mid America Drill Rig Not Applicable
Driller NA Logged By T Freudenrich Reviewed By
Drilling Method Hollow Stem Auger

WATER LEVEL DATA

While Drilling
At Completion of Drilling
Time After Drilling
Depth to Water

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

BORING LOG

Versar INC.

Client: US Navy
Project: supply side landfill
Location:

Boring No. MW5
Surface Elevation:
Job No. 1106840003002
Sheet 1 of 2

SAMPLE No.	Type	Rec (ft.)	PID (ppm)	Depth (ft.)	Profile	VISUAL DESCRIPTION	REMARKS
						Interbed layers of clay, landscape waste and general refuse.	Water present and continues down to 15 ft.
			2-6	5			LEL : 0 to 4%
				10			

Continued Next Page

GENERAL NOTES

Begin Drilling 11/15/02 Complete Drilling 11/15/02
Drilling Contractor Mid America Drill Rig Not Applicable
Driller NA Logged By T Freudenrich Reviewed By
Drilling Method Hollow Stem Auger

WATER LEVEL DATA

While Drilling
At Completion of Drilling
Time After Drilling
Depth to Water

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

BORING LOG

Versar INC.

Client: US Navy
Project: supply side landfill
Location:

Boring No. MW5
Surface Elevation:
Job No. 1106840003002
Sheet 2 of 2

SAMPLE No.	Type	Rec (ft.)	PID (ppm)	Depth (ft.)	Profile	VISUAL DESCRIPTION	REMARKS
						Silty CLAY (CL), stiff.	
				15		EOB at 15 feet Set temporary monitoring well, 2" diameter, 10' screen, 15' to 5' BGS	
				20			

GENERAL NOTES

Begin Drilling 11/15/02 Complete Drilling 11/15/02
Drilling Contractor Mid America Drill Rig Not Applicable
Driller NA Logged By T Freudenrich Reviewed By
Drilling Method Hollow Stem Auger

WATER LEVEL DATA

While Drilling
At Completion of Drilling
Time After Drilling
Depth to Water

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

APPENDIX B

GEOTECHNICAL TEST DATA

Great Lakes Soil & Environmental Consultants Inc.
333 Shore Drive, Burr Ridge, IL 60527 Ph: (630) 321-0944 Fax: (630) 321-0945

Moisture Content & Classification

Project	Supply Side Landfill						
Client	Versar, Inc. 200 West 22nd Street, Ste. 250, Lombard, IL 60148 Attn.: Mr. John Angstmann						
File No.	2555	Date Tested	12/2/2002	Tested By	NP	QC By	SB

Sample ID	Sample Type	Moisture Cont (%)	Liquid Limit	Plasticity Index	Class. (see note)
MW1X/#2	Jar	16.6	39	22	CL
GP3-4'	Jar	13.3			CL
GP4 0-18"	Shelby	15.7	34	18	CL
GP4-4'	Jar	8.3			SP
GP5-3'	Jar	17.2			CL
GP6 1.5-3.5'	Shelby	20.1	37	19	CL
GP7-3'	Jar	15.1			CL
GP7-6'	Jar	22.4	40	20	CL
GP8-2'	Jar	21.0	40	21	CL
GP8-6'	Jar	7.3			CL
GP11-3'	Jar	15.2			CL
GP11-8'	Jar	15.0			CL
GP12-3'	Jar	15.6			CL
GP12-5'	Jar	17.1			CL
GP13 3-5'	Shelby	**Hold**			CL
GP13-3'	Jar	17.7			CL
GP14 2-4'	Jar	15.4	35	19	CL
GP14-5'	Jar	20.6	35	27	CL
GP15 1-2'	Jar	15.9			CL
GP15 2-4'	Shelby	15.9	34	19	CL
MW2/5	Jar	18.2	43	25	CL
MW2/9	Jar	19.4	39	23	CL
MW3/#1	Jar	14.9	37	20	CL
GP18-22"	Jar	15.8			CL
GP19-3'	Jar	13.3	31	15	CL
GP21-2'	Jar	18.7			CL
GP22-1.5'	Jar	17.0			CL
GP23-6'	Jar	17.5			CL

Remarks

Classification is based on visual observation and/or Atterberg Limits tests. No grain size analyses were performed.

Great Lakes Soil & Environmental Consultants, Inc
333 Shore Drive, Burr Ridge, IL 60521 Ph: (630) 321-0944 Fax: (630) 321-0945

COEFFICIENT OF PERMEABILITY - ASTM D5084 (FLEXIBLE WALL)

Project	Supply Side Landfill						
Client	Versar, Inc. 200 West 22nd Street, Ste. 250, Lombard, IL 60148 Attn.: Mr. John Angstmann						
File #	2555	**Date Tested**	12/9/2002	**Tested by:**	NP	**QC by:**	SB
Sample ID:	GP-15 (2-4)	Date Recd.	11/27/02	**Location**	2'-4' in depth		
Sample Description	Brown silty clay						

Specimen Data

Initial

Diameter:	7.26	cm	Area, A:	41.4	sq cm
Height, L:	6.80	cm	Volume, V:	281.5	cu cm
Mass of Sample:	606.7	g	**Moisture Content:**	**15.9**	**%**
			Wet Density	**134.5**	**pcf**
			Dry Density	**116.1**	**pcf**

Final

Diameter:	7.25	cm	Area, A:	41.3	sq cm
Height, L:	6.87	cm	Volume, V:	283.6	cu cm
Mass of Sample:	611.90	g	**Moisture Content:**	**17.8**	**%**
			Wet Density	**134.6**	**pcf**
			Dry Density	**114.2**	**pcf**
			Deg of Saturation	**97.7**	

Test Data

Permeant:	De-aired Tap Water
Cell Pressure	80.0 psi
Top Pressure	75.0 psi
Bottom Pressure	78.0 psi
Gradient:	31.0

Date	Time	Elapsed Time (Sec)	Cumulative Time (Sec)	Burette Readings		Outflow/Inflow Ratio	Fluid Temp. oC	Permeability cm/sec
				Outflow cc	Inflow cc			
12/9/2002	9:15 AM	0	0	2.94	5.99		20.0	---
12/9/2002	10:15 AM	3600	3600	3.01	5.90	0.8	20.0	1.77E-08
12/9/2002	11:15 AM	3600	7200	3.07	5.83	0.9	20.0	1.38E-08
12/9/2002	12:25 PM	4200	11400	3.13	5.75	0.8	20.0	1.36E-08
12/9/2002	1:25 PM	3600	15000	3.18	5.69	0.8	20.0	1.20E-08
						Average Permeability =		**1.4E-08** cm/sec

Remarks:

Great Lakes Soil & Environmental Consultants, Inc 333 Shore Drive, Burr Ridge, IL 60521 Ph: (630) 321-0944 Fax: (630) 321-0945	COEFFICIENT OF PERMEABILITY - ASTM D5084 (FLEXIBLE WALL)

Project	Supply Side Landfill						
Client	Versar, Inc. 200 West 22nd Street, Ste. 250, Lombard, IL 60148 Attn.: Mr. John Angstmann						
File #	2555	**Date Tested**	12/9/2002	**Tested by:**	NP	**QC by:**	SB
Sample ID:	GP-6 (1.5-3.5)	Date Recd. 11/27/02	**Location**	1.5' to 3.5' in depth			
Sample Description	Dark brown & gray silty clay with traces of gravel						

Specimen Data

Initial

Diameter:	7.28	cm	Area, A:	41.6	sq cm
Height, L:	6.68	cm	Volume, V:	278.1	cu cm
Mass of Sample:	834.3	g	**Moisture Content:**	**20.1**	**%**
			Wet Density	**187.2**	**pcf**
			Dry Density	**155.9**	**pcf**

Final

Diameter:	7.24	cm	Area, A:	41.2	sq cm
Height, L:	6.70	cm	Volume, V:	275.8	cu cm
Mass of Sample:	835.40	g	**Moisture Content:**	**17.3**	**%**
			Wet Density	**189.0**	**pcf**
			Dry Density	**161.1**	**pcf**
			Deg of Saturation	**729.9**	

Test Data

Permeant:	De-aired Tap Water
Cell Pressure	80.0 psi
Top Pressure	75.0 psi
Bottom Pressure	77.0 psi
Gradient:	21.1

Date	Time	Elapsed Time (Sec)	Cumulative Time (Sec)	Burette Readings		Outflow/Inflow Ratio	Fluid Temp. oC	Permeability cm/sec
				Outflow cc	Inflow cc			
12/9/2002	9:15 AM	0	0	2.95	6.02		20.0	---
12/9/2002	10:15 AM	3600	3600	2.98	5.99	1.0	20.0	8.25E-09
12/9/2002	11:15 AM	3600	7200	3.01	5.96	1.0	20.0	8.28E-09
12/9/2002	12:25 PM	4200	11400	3.04	5.93	1.0	20.0	7.11E-09
12/9/2002	1:25 PM	3600	15000	3.07	5.90	1.0	20.0	8.32E-09
						Average Permeability =		**8.0E-09** cm/sec

Remarks:

A big piece of gravel was found in the sample when the test was completed during moisture content determination.

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COEFFICIENT OF PERMEABILITY - ASTM D5084 (FLEXIBLE WALL)

Project	Supply Side Landfill						
Client	Versar, Inc. 200 West 22nd Street, Ste. 250, Lombard, IL 60148 Attn.: Mr. John Angstmann						
File #	2555	**Date Tested**	12/9/2002	**Tested by:**	NP	**QC by:**	SB
Sample ID:	GP4 (0-18)	Date Recd. 11/27/02	**Location**				
Sample Description	Brown silty clay with traces of gravel						

Specimen Data

Initial

Diameter:	7.31	cm	Area, A:	42.0	sq cm
Height, L:	6.92	cm	Volume, V:	290.4	cu cm
Mass of Sample:	624.1	g	**Moisture Content:**	**15.7**	**%**
			Wet Density	**134.1**	**pcf**
			Dry Density	**115.9**	**pcf**

Final

Diameter:	7.34	cm	Area, A:	42.3	sq cm
Height, L:	6.90	cm	Volume, V:	292.0	cu cm
Mass of Sample:	627.80	g	**Moisture Content:**	**17.0**	**%**
			Wet Density	**134.2**	**pcf**
			Dry Density	**114.7**	**pcf**
			Deg of Saturation	**94.2**	

Test Data

Permeant:	De-aired Tap Water
Cell Pressure	80.0 psi
Top Pressure	75.0 psi
Bottom Pressure	77.0 psi
Gradient:	20.3

Date	Time	Elapsed Time (Sec)	Cumulative Time (Sec)	Burette Readings		Outflow/Inflow Ratio	Fluid Temp. oC	Permeability cm/sec
				Outflow cc	Inflow cc			
12/9/2002	9:15 AM	0	0	2.89	5.93		20.0	---
12/9/2002	10:15 AM	3600	3600	2.95	5.86	0.9	20.0	1.98E-08
12/9/2002	11:15 AM	3600	7200	3.00	5.80	0.8	20.0	1.71E-08
12/9/2002	12:25 PM	4200	11400	3.05	5.74	0.8	20.0	1.47E-08
12/9/2002	1:25 PM	3600	15000	3.10	5.68	0.8	20.0	1.73E-08
						Average Permeability =		**1.7E-08** cm/sec

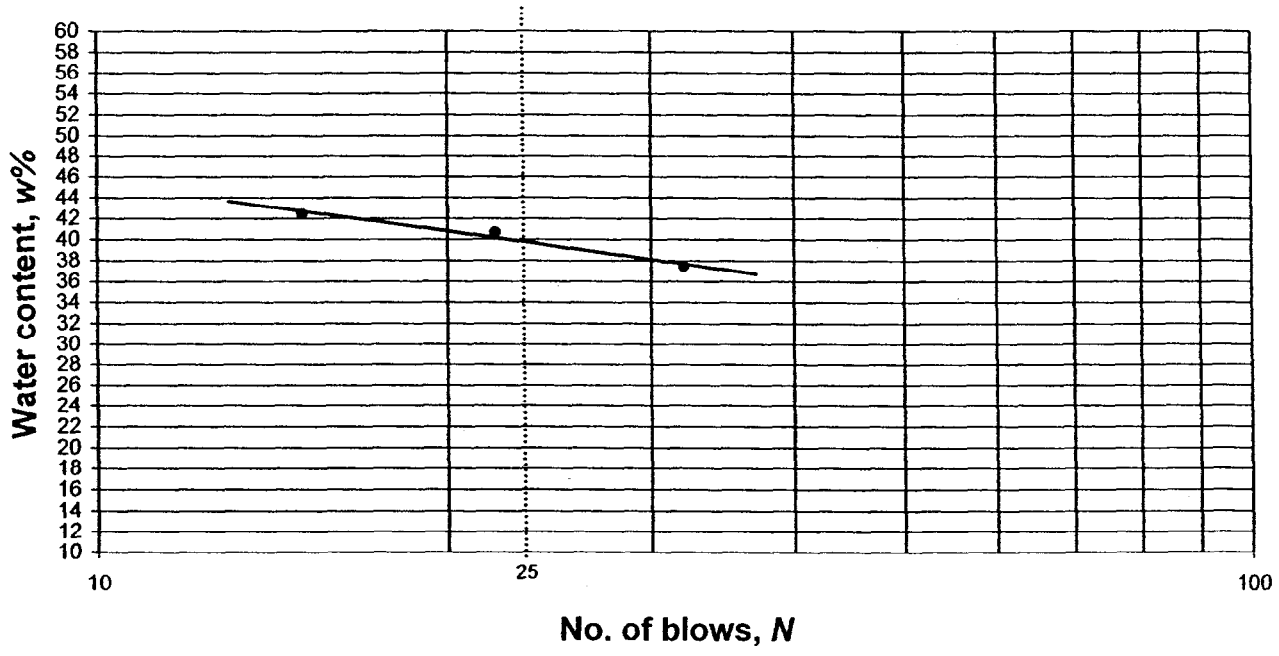
Remarks:

Great Lakes Soil & Environmental Consultants Inc. 333 Shore Drive, Burr Ridge, IL 60521 Ph: (630) 321-0944 Fax: (630) 321-0945	Atterberg Limits (ASTM D4318)

Project	Supply Side Landfill						
Client	Versar, Inc. 200 West 22nd Street, Ste. 250, Lombard, IL 60148 Attn.: Mr. John Angstmann						
File No.	2555	**Sample #**	MW1x/#2	**Date Tested**	12/5/2002	**Tested By**	NP
						Qc By	SB

Date Sample Recd.	11/27/2002
Sample Location	
Sample Description	Brown silty clay with traces of gravel

LIQUID LIMIT DETERMINATION



Results

Liquid Limit, LL	39	Plastic Limit, PL	17	Plasticity Index, PI	22

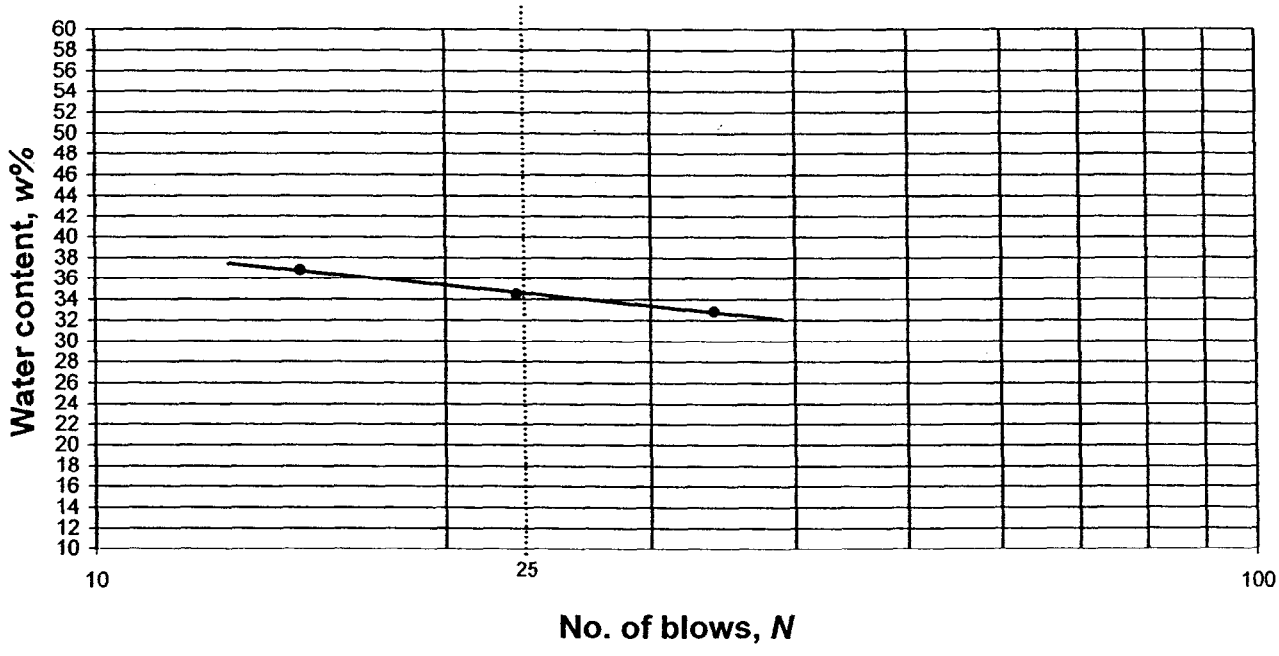
Remarks

	Great Lakes Soil & Environmental Consultants Inc. 333 Shore Drive, Burr Ridge, IL 60521 Ph: (630) 321-0944 Fax: (630) 321-0945	**Atterberg Limits** **(ASTM D4318)**

Project	Supply Side Landfill						
Client	Versar, Inc. 200 West 22nd Street, Ste. 250, Lombard, IL 60148 Attn.: Mr. John Angstmann						
File No.	2555	**Sample #**	GP4 (0-18)	**Date Tested**	12/4/2002	**Tested By**	NP
						Qc By	SB

Date Sample Recd.	11/27/2002
Sample Location	
Sample Description	Brown silty clay with traces of gravel

LIQUID LIMIT DETERMINATION



Results					
Liquid Limit, LL	**34**	**Plastic Limit, PL**	**16**	**Plasticity Index, PI**	**18**

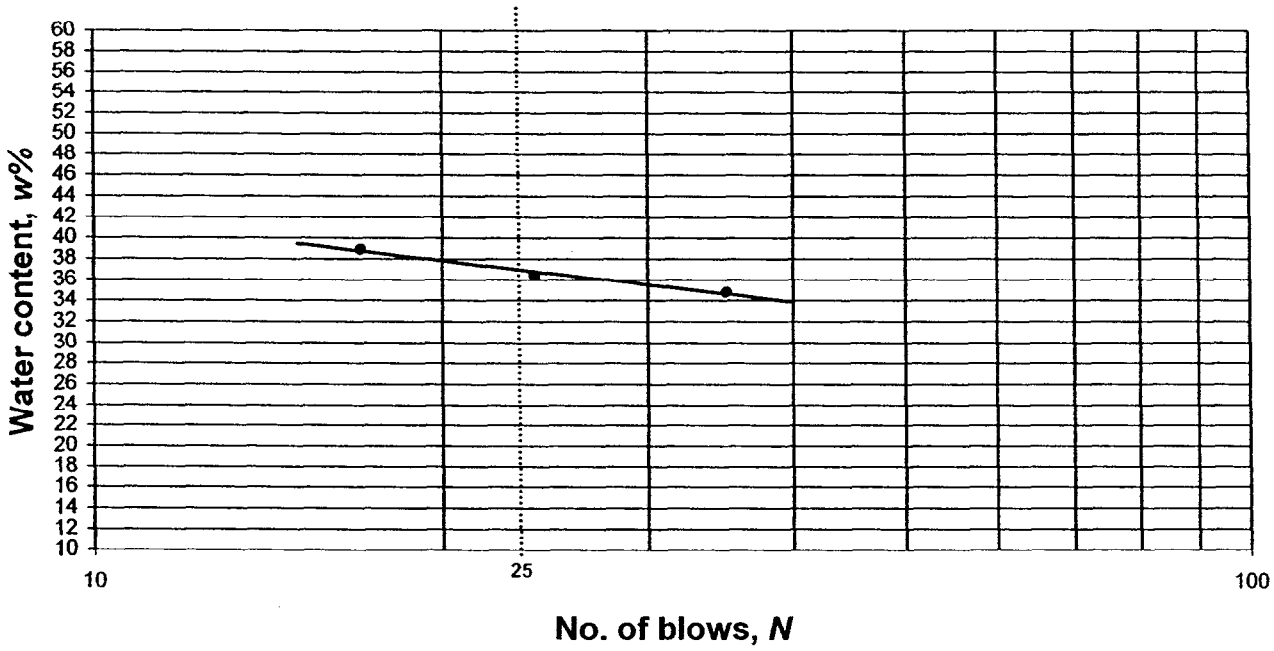
Remarks

Great Lakes Soil & Environmental Consultants Inc. 333 Shore Drive, Burr Ridge, IL 60521 Ph: (630) 321-0944 Fax: (630) 321-0945	Atterberg Limits (ASTM D4318)

Project	Supply Side Landfill						
Client	Versar, Inc. 200 West 22nd Street, Ste. 250, Lombard, IL 60148 Attn.: Mr. John Angstmann						
File No.	2555	**Sample #**	GP-6 (1.5-3.5)	**Date Tested**	12/5/2002	**Tested By**	NP
						Qc By	SB

Date Sample Recd.	11/27/2002
Sample Location	1.5' to 3.5' in depth
Sample Description	Dark brown & gray silty clay with traces of gravel

LIQUID LIMIT DETERMINATION



Results

Liquid Limit, LL	37	Plastic Limit, PL	18	Plasticity Index, PI	19

Remarks

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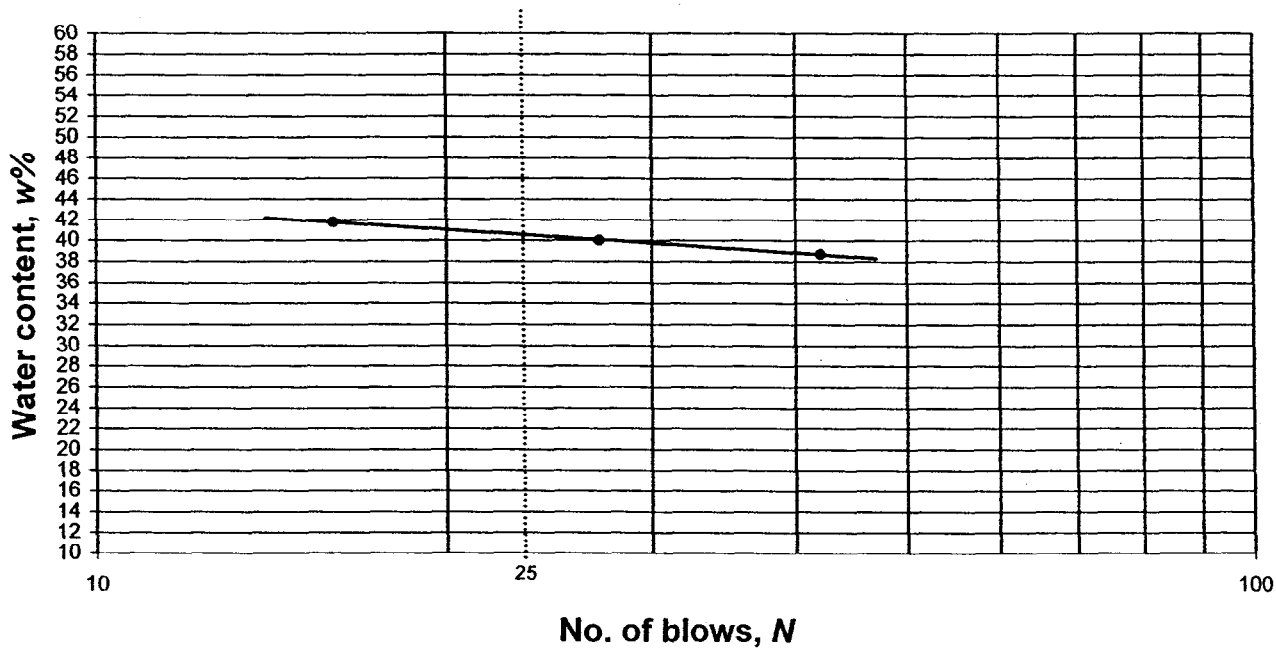
Atterberg Limits

(ASTM D4318)

Project	Supply Side Landfill						
Client	Versar, Inc. 200 West 22nd Street, Ste. 250, Lombard, IL 60148 Attn.: Mr. John Angstmann						
File No.	2555	**Sample #**	GP-7 (6)	**Date Tested**	12/5/2002	**Tested By**	NP
						Qc By	SB

Date Sample Recd.	11/27/2002
Sample Location	6' in depth
Sample Description	Dark brown silty clay

LIQUID LIMIT DETERMINATION



Results

Liquid Limit, LL	**40**	**Plastic Limit, PL**	**20**	**Plasticity Index, PI**	**20**

Remarks

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333 Shore Drive, Burr Ridge, IL 60521 Ph: (630) 321-0944 Fax: (630) 321-0945

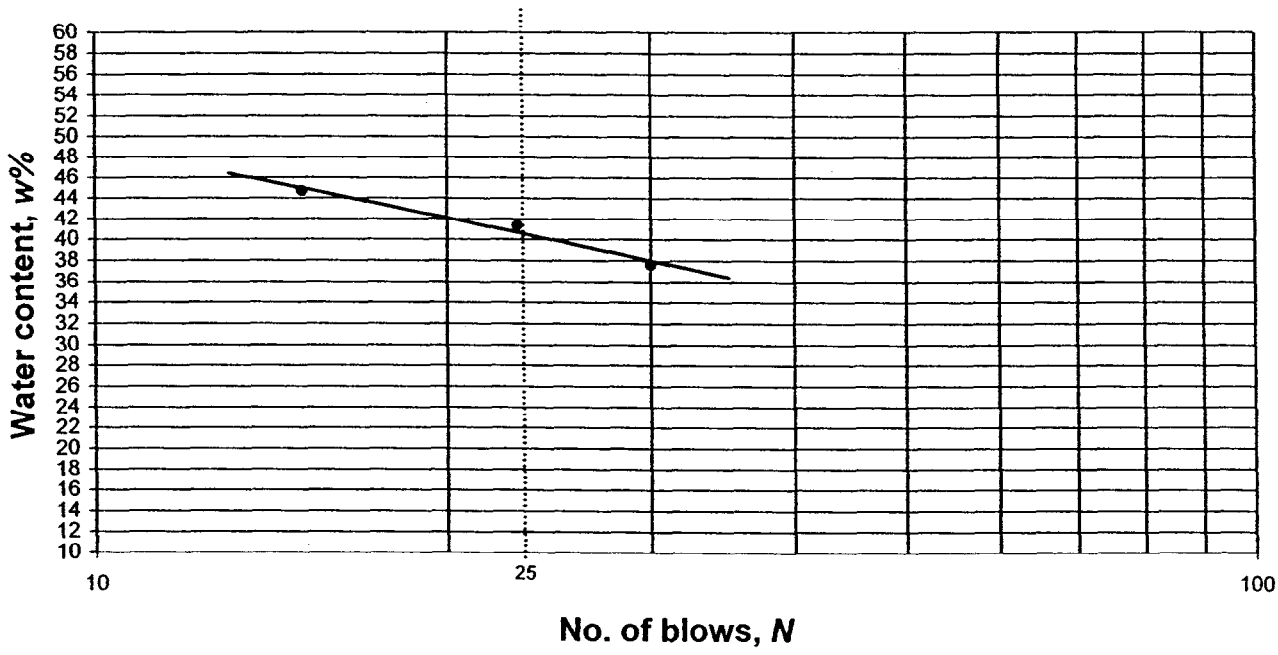
Atterberg Limits

(ASTM D4318)

Project	Supply Side Landfill						
Client	Versar, Inc. 200 West 22nd Street, Ste. 250, Lombard, IL 60148 Attn.: Mr. John Angstmann						
File No.	2555	**Sample #**	GP-8 (2)	**Date Tested**	12/5/2002	**Tested By**	NP
						Qc By	SB

Date Sample Recd.	11/27/2002
Sample Location	2' in depth
Sample Description	Dark brown silty clay with traces of gravel

LIQUID LIMIT DETERMINATION



Results

Liquid Limit, LL	40	**Plastic Limit, PL**	19	**Plasticity Index, PI**	21

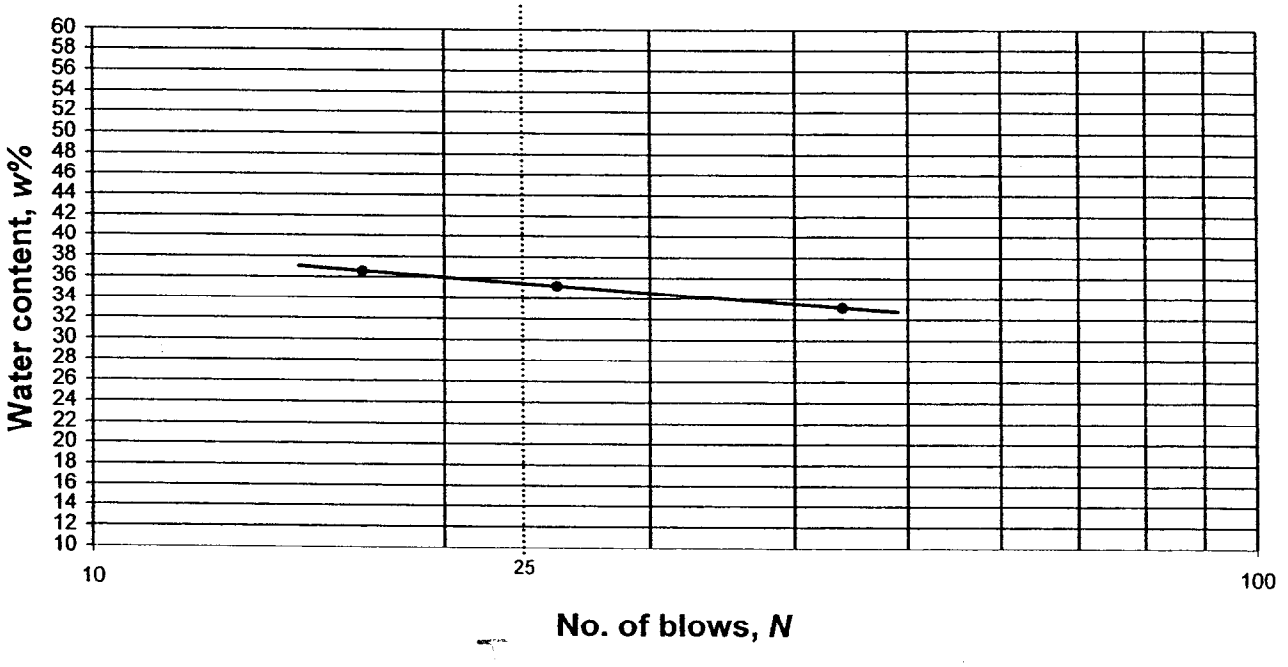
Remarks

Great Lakes Soil & Environmental Consultants Inc. 333 Shore Drive, Burr Ridge, IL 60521 Ph: (630) 321-0944 Fax: (630) 321-0945	Atterberg Limits (ASTM D4318)

Project	Supply Side Landfill						
Client	Versar, Inc. 200 West 22nd Street, Ste. 250, Lombard, IL 60148 Attn.: Mr. John Angstmann						
File No.	2555	**Sample #**	GP-14 (2-4)	**Date Tested**	12/4/2002	**Tested By**	NP
						Qc By	SB

Date Sample Recd.	11/27/2002
Sample Location	2'-4' in depth
Sample Description	Brown silty clay with traces of gravel

LIQUID LIMIT DETERMINATION



Results

Liquid Limit, LL	35	**Plastic Limit, PL**	16	**Plasticity Index, PI**	19

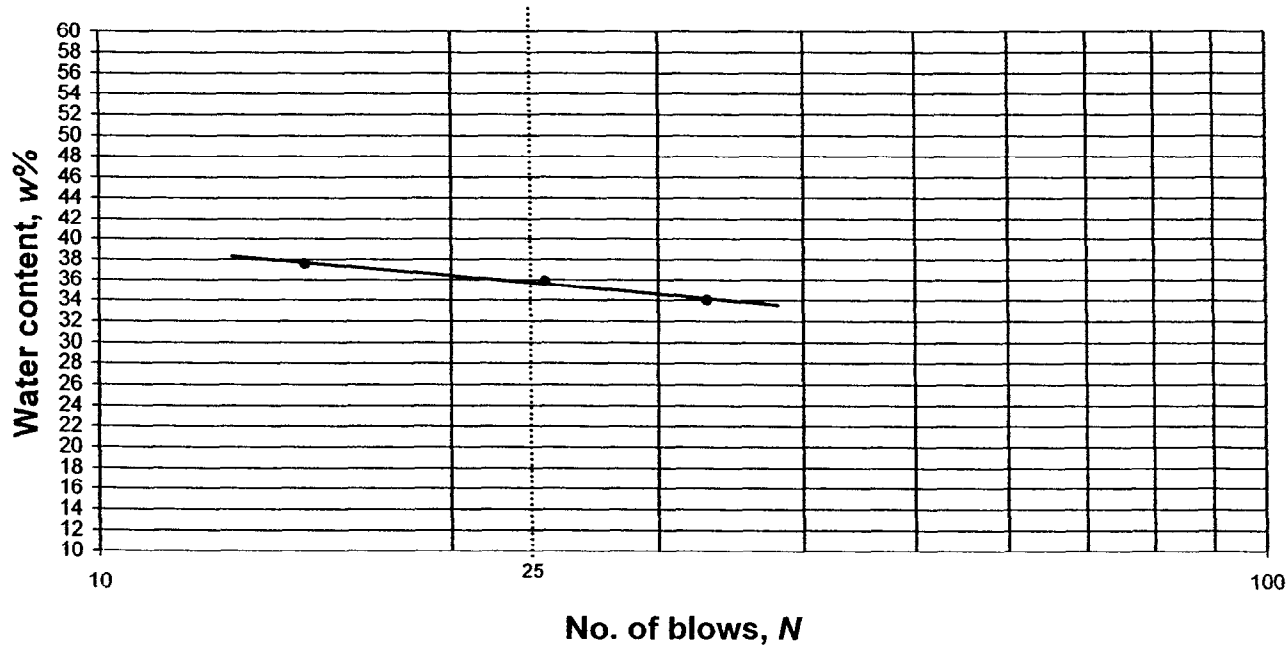
Remarks

	Great Lakes Soil & Environmental Consultants Inc. 333 Shore Drive, Burr Ridge, IL 60521 Ph: (630) 321-0944 Fax: (630) 321-0945	**Atterberg Limits** **(ASTM D4318)**

Project	Supply Side Landfill						
Client	Versar, Inc. 200 West 22nd Street, Ste. 250, Lombard, IL 60148 Attn.: Mr. John Angstmann						
File No.	2555	**Sample #**	GP-14 (5)	**Date Tested**	12/4/2002	**Tested By**	NP
						Qc By	SB

Date Sample Recd.	11/27/2002
Sample Location	5' in Depth
Sample Description	Dark brown silty clay with organic content

LIQUID LIMIT DETERMINATION



Results

Liquid Limit, LL	35	**Plastic Limit, PL**	8	**Plasticity Index, PI**	27

Remarks

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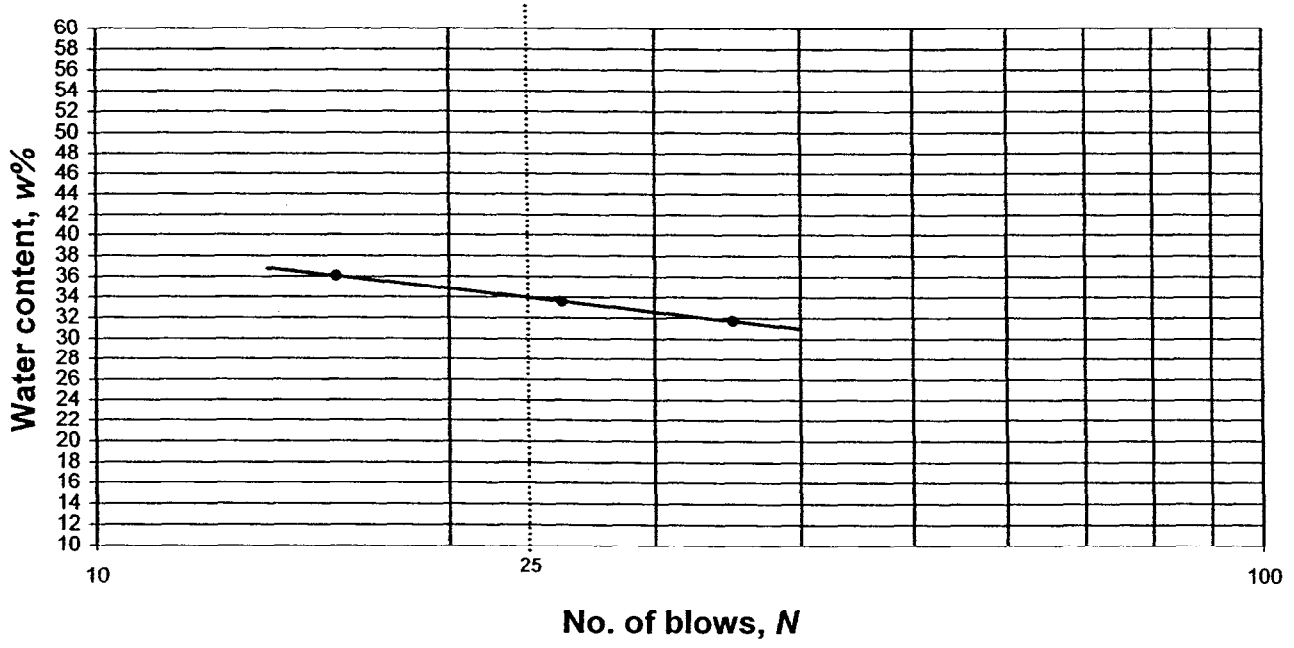
Project	Supply Side Landfill						
Client	Versar, Inc. 200 West 22nd Street, Ste. 250, Lombard, IL 60148 Attn.: Mr. John Angstmann						
File No.	2555	**Sample #**	GP-15 (2-4)	**Date Tested**	12/4/2002	**Tested By**	NP
						Qc By	SB

Date Sample Recd.	11/27/2002
Sample Location	2'-4' in depth
Sample Description	Brown silty clay

LIQUID LIMIT DETERMINATION



Results

Liquid Limit, LL	34	**Plastic Limit, PL**	15	**Plasticity Index, PI**	19

Remarks

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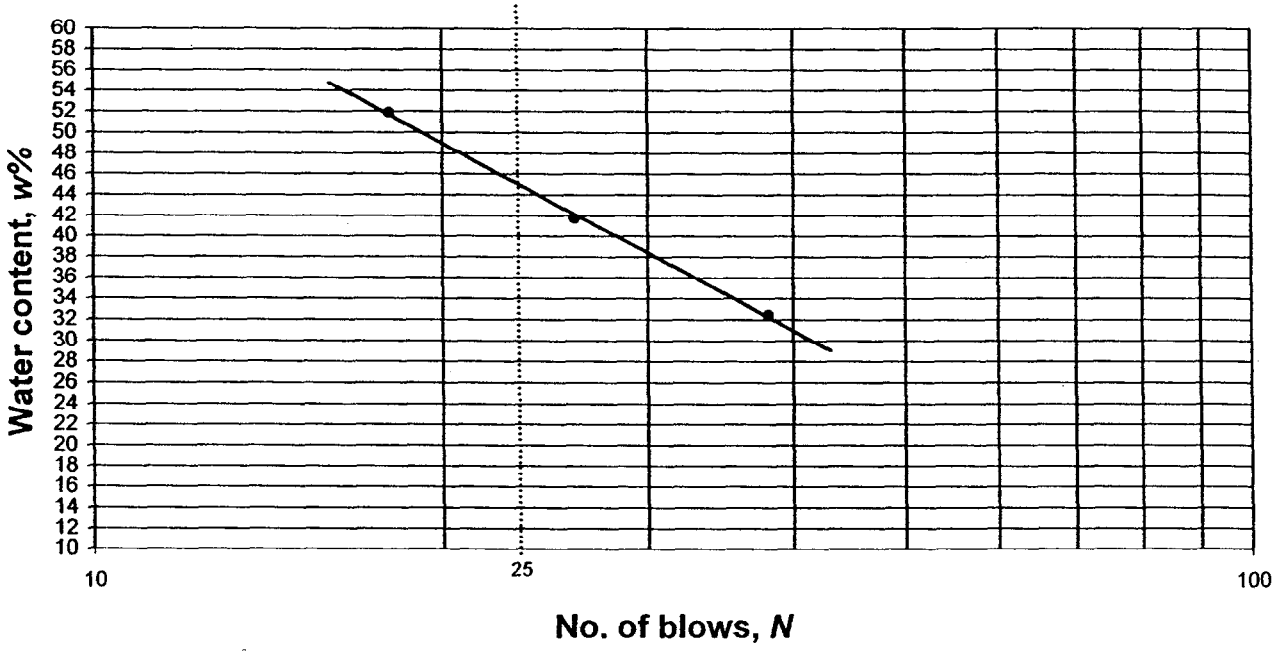
Atterberg Limits

(ASTM D4318)

Project	Supply Side Landfill						
Client	Versar, Inc. 200 West 22nd Street, Ste. 250, Lombard, IL 60148 Attn.: Mr. John Angstmann						
File No.	2555	**Sample #**	MW2/5	**Date Tested**	12/5/2002	**Tested By**	NP
						Qc By	SB

Date Sample Recd.	11/27/2002
Sample Location	5' in depth
Sample Description	Brown silty clay

LIQUID LIMIT DETERMINATION



Results

Liquid Limit, LL	43	**Plastic Limit, PL**	18	**Plasticity Index, PI**	25

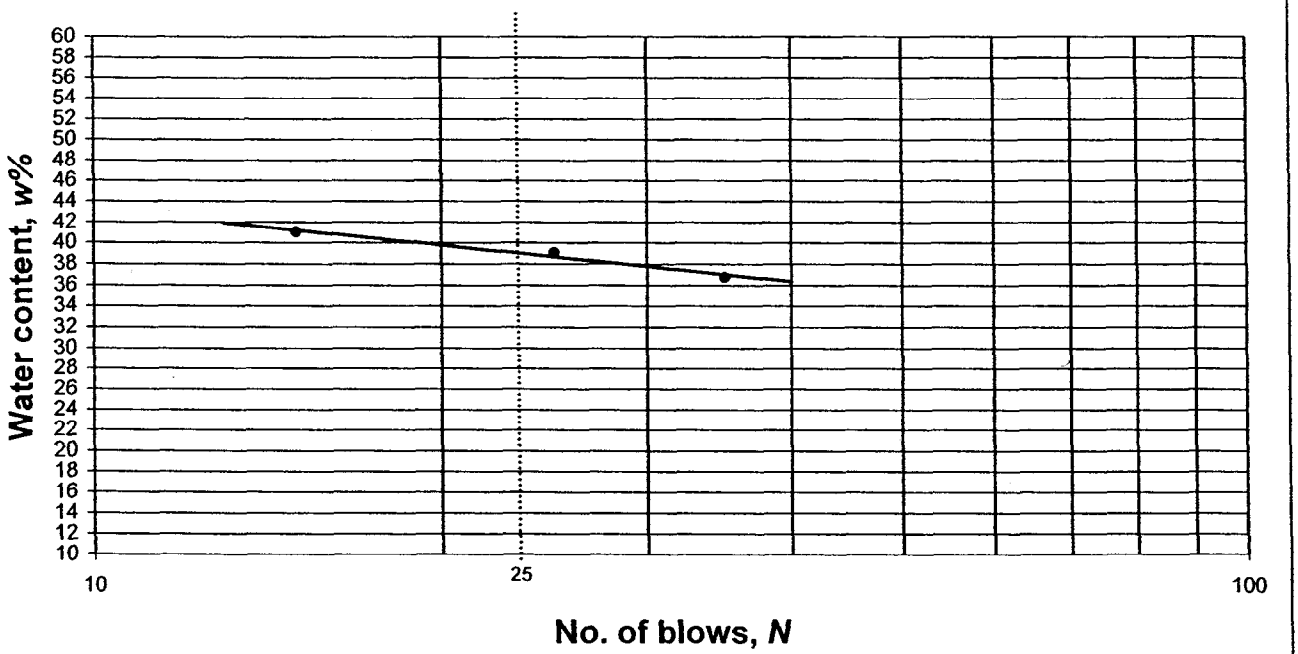
Remarks

	Great Lakes Soil & Environmental Consultants Inc. 333 Shore Drive, Burr Ridge, IL 60521 Ph: (630) 321-0944 Fax: (630) 321-0945	**Atterberg Limits** **(ASTM D4318)**

Project	Supply Side Landfill						
Client	Versar, Inc. 200 West 22nd Street, Ste. 250, Lombard, IL 60148 Attn.: Mr. John Angstmann						
File No.	2555	**Sample #**	MW2/9	**Date Tested**	12/5/2002	**Tested By**	NP
						Qc By	SB

Date Sample Recd.	11/27/2002
Sample Location	9' in depth
Sample Description	Gray silty clay with traces of gravel

LIQUID LIMIT DETERMINATION



Results

Liquid Limit, LL	**39**	**Plastic Limit, PL**	**16**	**Plasticity Index, PI**	**23**

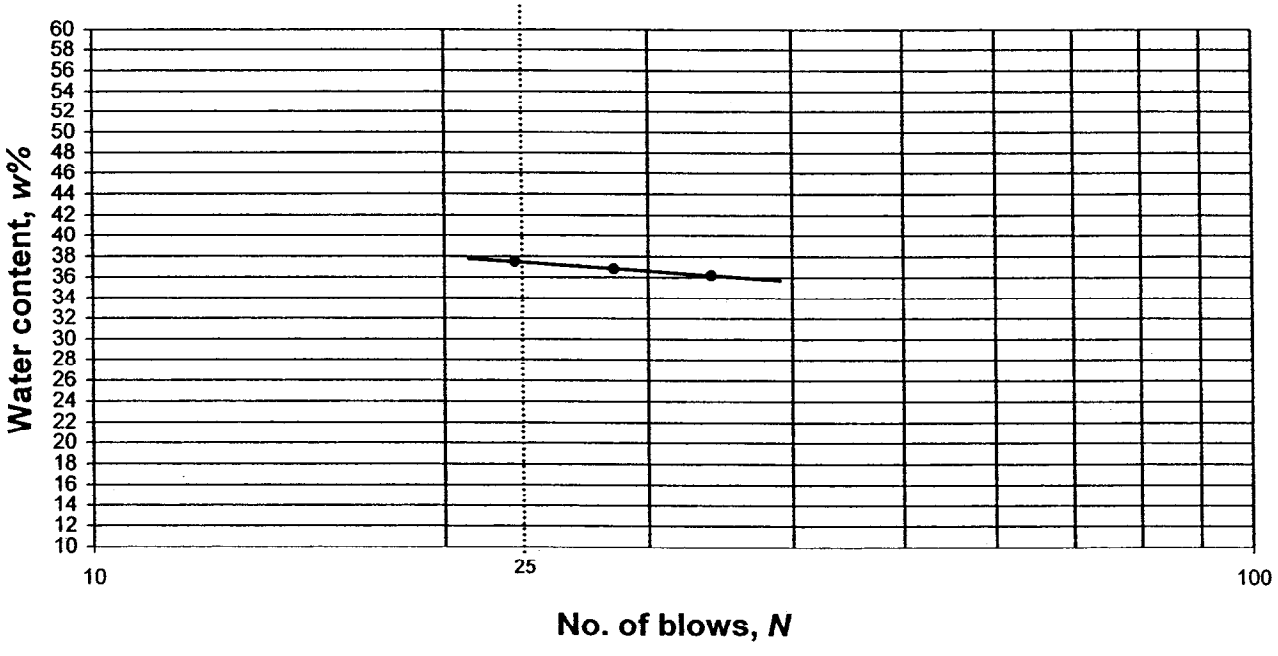
Remarks

Great Lakes Soil & Environmental Consultants Inc. 333 Shore Drive, Burr Ridge, IL 60521 Ph: (630) 321-0944 Fax: (630) 321-0945	Atterberg Limits (ASTM D4318)

Project	Supply Side Landfill						
Client	Versar, Inc. 200 West 22nd Street, Ste. 250, Lombard, IL 60148 Attn.: Mr. John Angstmann						
File No.	2555	Sample #	MW3/#1	Date Tested	12/4/2002	Tested By	NP
						Qc By	SB

Date Sample Recd.	11/27/2002
Sample Location	
Sample Description	Light brown & brown silty sandy clay with traces gravel

LIQUID LIMIT DETERMINATION



Results					
Liquid Limit, LL	37	Plastic Limit, PL	17	Plasticity Index, PI	20

Remarks

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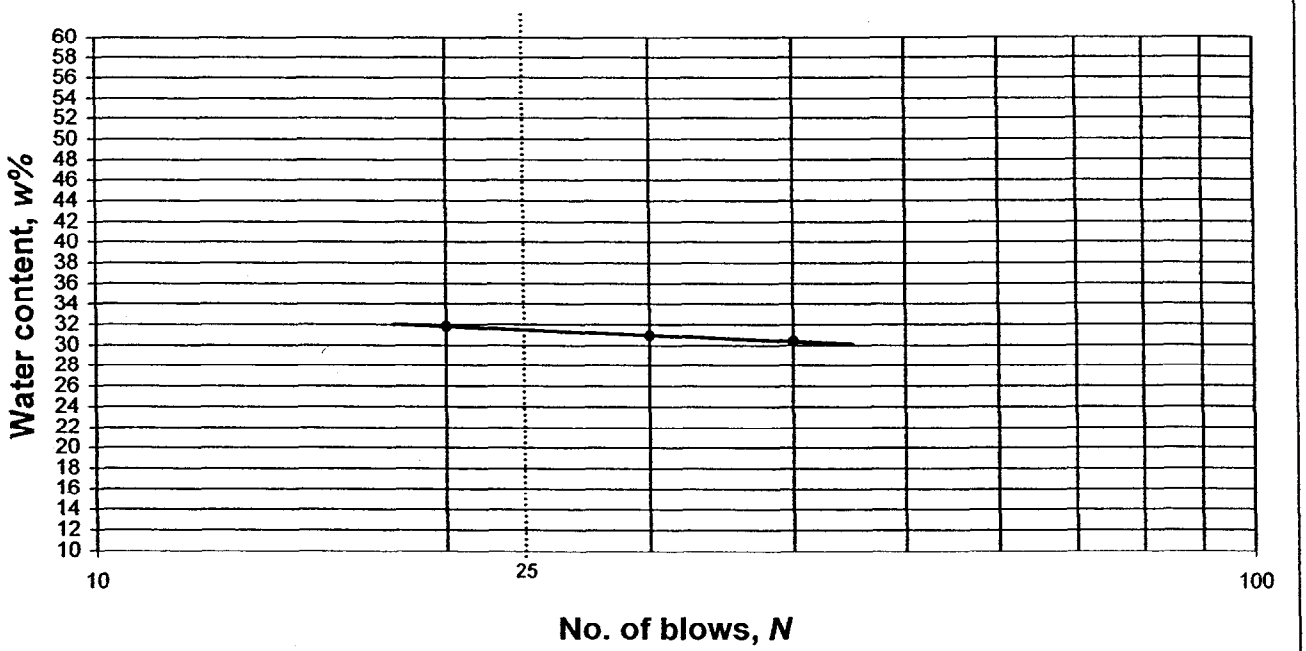
Atterberg Limits

(ASTM D4318)

Project	Supply Side Landfill						
Client	Versar, Inc. 200 West 22nd Street, Ste. 250, Lombard, IL 60148 Attn.: Mr. John Angstmann						
File No.	2555	**Sample #**	GP-19 (3)	**Date Tested**	12/4/2002	**Tested By**	NP
						Qc By	SB

Date Sample Recd.	11/27/2002
Sample Location	3' in depth
Sample Description	Dark Brown silty sandy clay with traces of gravel

LIQUID LIMIT DETERMINATION



Results

Liquid Limit, LL	31	**Plastic Limit, PL**	16	**Plasticity Index, PI**	15

Remarks

APPENDIX C

ANALYTICAL DATA

SEVERN TRENT SERVICES

STL Chicago

SEVERN TRENT LABORATORIES ANALYTICAL REPORT

JOB NUMBER: 213781

Prepared For:

Versar, Inc.
Green Brook Executive Center
Ste. 250
200 West 22nd Street
Lombard, IL 60148
Project: Great Lakes NS-Supply Side Landfill

Attention: Donna Oswald

Date: 12/12/2002

Nancy S. McDonald
Signature

12/12/02
Date

Name: Nancy S. McDonald

Title: Project Manager

E-Mail: nmcdonald@stl-inc.com

STL Chicago
2417 Bond Street
University Park, IL 60466

PHONE: (708) 534-5200
FAX..: (708) 534-5211

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Severn Trent Laboratories Chicago
GC/MS Case Narrative

Versar
Great Lakes NS Supply Side Landfill
Job# 213781
VOA DATA:

1. The water sample was properly analyzed within the 14-day required hold time from date collected.

2. All Method Blank target compounds were below reporting limits.

3. The LCS (Laboratory Control Sample) sample had all spike recoveries within the in-house generated QC limits.

4. Matrix Spike/Matrix Spike Duplicate analyses were not performed on this sample set.

5. The volatile sample had surrogate recoveries within the in-house generated QC limits.

6. The water sample was prepared using Method 5030B and analyzed following SW846 Method 8260B and 8000B. All calibration criteria were met per method or SOP (for minimum R values for certain compounds). The low point in the initial calibration verifies the base reporting limits. The target compounds were quantitated using the initial calibration.

7. All of the internal standard areas and retention times were within SOP acceptance limits as compared to the corresponding calibration verification standard.

8. The water sample was analyzed using a 25-mL purge volume. An initial dilution was required on sample 4 due to a foaming matrix. The results and reporting limits were adjusted to account for the dilutions performed.

JoAnn Petruszak
GC/MS VOA Dept.

12-12-02
Date

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SAMPLE INFORMATION
Date: 12/12/2002

Job Number.: 213781
Customer...: Versar, Inc.
Attn.....: Donna Oswald

Project Number.....: 20002823
Customer Project ID....: SUPPLY SIDE LANDFILL
Project Description....: Great Lakes NS-Supply Side Landfill

Laboratory Sample ID	Customer Sample ID	Sample Matrix	Date Sampled	Time Sampled	Date Received	Time Received
213781-1	MW4	Water	11/25/2002	08:30	11/26/2002	09:45
213781-2	MW3	Water	11/25/2002	09:45	11/26/2002	09:45
213781-3	MW2	Water	11/25/2002	10:15	11/26/2002	09:45
213781-4	MW1	Water	11/25/2002	10:45	11/26/2002	09:45
213781-5	MW5	Water	11/25/2002	11:30	11/26/2002	09:45

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LABORATORY TEST RESULTS

Job Number: 213781

Date: 12/12/2002

CUSTOMER: Versar, Inc. PROJECT: SUPPLY SIDE LANDFILL ATTN: Donna Oswald

Customer Sample ID: MW4
Date Sampled.....: 11/25/2002
Time Sampled.....: 08:30
Sample Matrix.....: Water

Laboratory Sample ID: 213781-1
Date Received.....: 11/26/2002
Time Received.....: 09:45

TEST METHOD	PARAMETER/TEST DESCRIPTION	SAMPLE RESULT	REPORTING LIMIT	UNITS	DATE	TECH
350.2	Nitrogen, Ammonia (Dist./Nessler.)					
	Ammonia(NH3+NH4),as N	48	10	mg/L	12/03/02	jmk
9056	Ion Chromatography Analysis					
	Chloride	320	25	mg/L	12/03/02	cvw
	Sulfate	4.6	0.20	mg/L	12/03/02	cvw
420.2	Phenolics, Total Recoverable					
	Phenolics, Total Recoverable	<0.0050	0.0050	mg/L	11/27/02	kd
150.1	pH (Water)					
	pH	6.76	0.20	pH Units	11/26/02	nrp
160.1	Solids, Total Dissolved (TDS)					
	Solids, Total Dissolved (TDS)	1400	10	mg/L	12/02/02	jmk
415.1	Organic Carbon					
	TOC Average Duplicates	23	2.0	mg/L	12/06/02	kd
6010B	Metals Analysis (ICAP Trace)					
	Iron	140	0.050	mg/L	12/05/02	tds
	Lead	0.11	0.0050	mg/L	12/05/02	tds
	Manganese	4.1	0.010	mg/L	12/05/02	tds

* In Description = Dry Wgt.

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LABORATORY TEST RESULTS

Job Number: 213781 Date: 12/12/2002

CUSTOMER: Versar, Inc. PROJECT: SUPPLY SIDE LANDFILL ATTN: Donna Oswald

Customer Sample ID: MW3
Date Sampled.....: 11/25/2002
Time Sampled.....: 09:45
Sample Matrix.....: Water

Laboratory Sample ID: 213781-2
Date Received.....: 11/26/2002
Time Received.....: 09:45

TEST METHOD	PARAMETER/TEST DESCRIPTION	SAMPLE RESULT	REPORTING LIMIT	UNITS	DATE	TECH
350.2	Nitrogen, Ammonia (Dist./Nessler.)					
	Ammonia(NH3+NH4),as N	20	5.0	mg/L	12/03/02	jmk
9056	Ion Chromatography Analysis					
	Chloride	330	25	mg/L	12/03/02	cvw
	Sulfate	1.9	0.20	mg/L	12/03/02	cvw
420.2	Phenolics, Total Recoverable					
	Phenolics, Total Recoverable	0.49	0.0050	mg/L	11/27/02	kd
150.1	pH (Water)					
	pH	6.65	0.20	pH Units	11/26/02	nrp
160.1	Solids, Total Dissolved (TDS)					
	Solids, Total Dissolved (TDS)	2200	10	mg/L	12/02/02	jmk
415.1	Organic Carbon					
	TOC Average Duplicates	350	25	mg/L	12/06/02	kd
6010B	Metals Analysis (ICAP Trace)					
	Iron	410	0.050	mg/L	12/05/02	tds
	Lead	9.0	0.0050	mg/L	12/05/02	tds
	Manganese	7.5	0.010	mg/L	12/05/02	tds

* In Description = Dry Wgt.

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LABORATORY TEST RESULTS

Job Number: 213781 Date: 12/12/2002

CUSTOMER: Versar, Inc. PROJECT: SUPPLY SIDE LANDFILL ATTN: Donna Oswald

Customer Sample ID: MW2
Date Sampled.....: 11/25/2002
Time Sampled.....: 10:15
Sample Matrix.....: Water

Laboratory Sample ID: 213781-3
Date Received.....: 11/26/2002
Time Received.....: 09:45

TEST METHOD	PARAMETER/TEST DESCRIPTION	SAMPLE RESULT	REPORTING LIMIT	UNITS	DATE	TECH
350.2	Nitrogen, Ammonia (Dist./Nessler.)					
	Ammonia(NH3+NH4),as N	46	10	mg/L	12/03/02	jmk
9056	Ion Chromatography Analysis					
	Chloride	1500	50	mg/L	12/03/02	cvw
	Sulfate	1100	50	mg/L	12/03/02	cvw
420.2	Phenolics, Total Recoverable					
	Phenolics, Total Recoverable	0.28	0.0050	mg/L	11/27/02	kd
150.1	pH (Water)					
	pH	6.13	0.20	pH Units	11/26/02	nrp
160.1	Solids, Total Dissolved (TDS)					
	Solids, Total Dissolved (TDS)	14000	10	mg/L	12/02/02	jmk
415.1	Organic Carbon					
	TOC Average Duplicates	5600	500	mg/L	12/06/02	kd
6010B	Metals Analysis (ICAP Trace)					
	Iron	270	0.25	mg/L	12/05/02	tds
	Lead	0.17	0.025	mg/L	12/05/02	tds
	Manganese	17	0.050	mg/L	12/05/02	tds

* In Description = Dry Wgt.

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LABORATORY TEST RESULTS

Job Number: 213781 Date: 12/12/2002

CUSTOMER: Versar, Inc. PROJECT: SUPPLY SIDE LANDFILL ATTN: Donna Oswald

Customer Sample ID: MW1
Date Sampled.....: 11/25/2002
Time Sampled.....: 10:45
Sample Matrix.....: Water

Laboratory Sample ID: 213781-4
Date Received.....: 11/26/2002
Time Received.....: 09:45

TEST METHOD	PARAMETER/TEST DESCRIPTION	SAMPLE RESULT	REPORTING LIMIT	UNITS	DATE	TECH
350.2	Nitrogen, Ammonia (Dist./Nessler.)					
	Ammonia(NH3+NH4),as N	120	10	mg/L	12/03/02	jmk
9056	Ion Chromatography Analysis					
	Chloride	1800	100	mg/L	12/03/02	cvw
	Sulfate	15	5.0	mg/L	12/03/02	cvw
420.2	Phenolics, Total Recoverable					
	Phenolics, Total Recoverable	0.25	0.0050	mg/L	11/27/02	kd
150.1	pH (Water)					
	pH	7.36	0.20	pH Units	11/26/02	nrp
160.1	Solids, Total Dissolved (TDS)					
	Solids, Total Dissolved (TDS)	4000	10	mg/L	12/02/02	jmk
415.1	Organic Carbon					
	TOC Average Duplicates	330	25	mg/L	12/06/02	kd
6010B	Metals Analysis (ICAP Trace)					
	Iron	13	0.050	mg/L	12/05/02	tds
	Lead	0.53	0.0050	mg/L	12/05/02	tds
	Manganese	0.24	0.010	mg/L	12/05/02	tds
8260B	Volatile Organics					
	Dichlorodifluoromethane	ND	10	ug/L	12/06/02	jdn
	Chloromethane	ND	10	ug/L	12/06/02	jdn
	Vinyl chloride	ND	10	ug/L	12/06/02	jdn
	Bromomethane	ND	10	ug/L	12/06/02	jdn
	Chloroethane	ND	10	ug/L	12/06/02	jdn
	Trichlorofluoromethane	ND	10	ug/L	12/06/02	jdn
	1,1-Dichloroethene	ND	10	ug/L	12/06/02	jdn
	Carbon disulfide	ND	50	ug/L	12/06/02	jdn
	Acetone	ND	50	ug/L	12/06/02	jdn
	Methylene chloride	ND	10	ug/L	12/06/02	jdn
	trans-1,2-Dichloroethene	ND	10	ug/L	12/06/02	jdn
	Methyl-tert-butyl-ether (MTBE)	ND	10	ug/L	12/06/02	jdn
	1,1-Dichloroethane	ND	10	ug/L	12/06/02	jdn
	2,2-Dichloropropane	ND	10	ug/L	12/06/02	jdn
	cis-1,2-Dichloroethene	ND	10	ug/L	12/06/02	jdn
	2-Butanone (MEK)	ND	50	ug/L	12/06/02	jdn
	Bromochloromethane	ND	10	ug/L	12/06/02	jdn
	Chloroform	ND	10	ug/L	12/06/02	jdn
	1,1,1-Trichloroethane	ND	10	ug/L	12/06/02	jdn
	1,1-Dichloropropene	ND	10	ug/L	12/06/02	jdn
	Carbon tetrachloride	ND	10	ug/L	12/06/02	jdn
	Benzene	ND	10	ug/L	12/06/02	jdn
	1,2-Dichloroethane	ND	10	ug/L	12/06/02	jdn
	Trichloroethene	ND	10	ug/L	12/06/02	jdn

* In Description = Dry Wgt.

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LABORATORY TEST RESULTS

Job Number: 213781 Date: 12/12/2002

CUSTOMER: Versar, Inc. PROJECT: SUPPLY SIDE LANDFILL ATTN: Donna Oswald

Customer Sample ID: MW1
Date Sampled.....: 11/25/2002
Time Sampled.....: 10:45
Sample Matrix.....: Water

Laboratory Sample ID: 213781-4
Date Received.....: 11/26/2002
Time Received.....: 09:45

TEST METHOD	PARAMETER/TEST DESCRIPTION	SAMPLE RESULT	REPORTING LIMIT	UNITS	DATE	TECH
	1,2-Dichloropropane	ND	10	ug/L	12/06/02	jdn
	Dibromomethane	ND	10	ug/L	12/06/02	jdn
	Bromodichloromethane	ND	10	ug/L	12/06/02	jdn
	cis-1,3-Dichloropropene	ND	10	ug/L	12/06/02	jdn
	4-Methyl-2-pentanone (MIBK)	ND	50	ug/L	12/06/02	jdn
	Toluene	31	10	ug/L	12/06/02	jdn
	trans-1,3-Dichloropropene	ND	10	ug/L	12/06/02	jdn
	1,1,2-Trichloroethane	ND	10	ug/L	12/06/02	jdn
	Tetrachloroethene	ND	10	ug/L	12/06/02	jdn
	1,3-Dichloropropane	ND	10	ug/L	12/06/02	jdn
	2-Hexanone	ND	50	ug/L	12/06/02	jdn
	Dibromochloromethane	ND	10	ug/L	12/06/02	jdn
	1,2-Dibromoethane (EDB)	ND	10	ug/L	12/06/02	jdn
	Chlorobenzene	ND	10	ug/L	12/06/02	jdn
	1,1,1,2-Tetrachloroethane	ND	10	ug/L	12/06/02	jdn
	Ethylbenzene	23	10	ug/L	12/06/02	jdn
	m&p-Xylenes	44	20	ug/L	12/06/02	jdn
	o-Xylene	22	10	ug/L	12/06/02	jdn
	Styrene	ND	10	ug/L	12/06/02	jdn
	Bromoform	ND	10	ug/L	12/06/02	jdn
	Isopropylbenzene	ND	10	ug/L	12/06/02	jdn
	Bromobenzene	ND	10	ug/L	12/06/02	jdn
	1,1,2,2-Tetrachloroethane	ND	10	ug/L	12/06/02	jdn
	1,2,3-Trichloropropane	ND	10	ug/L	12/06/02	jdn
	n-Propylbenzene	ND	10	ug/L	12/06/02	jdn
	2-Chlorotoluene	ND	10	ug/L	12/06/02	jdn
	1,3,5-Trimethylbenzene	ND	10	ug/L	12/06/02	jdn
	4-Chlorotoluene	ND	10	ug/L	12/06/02	jdn
	tert-Butylbenzene	ND	10	ug/L	12/06/02	jdn
	1,2,4-Trimethylbenzene	22	10	ug/L	12/06/02	jdn
	sec-Butylbenzene	ND	10	ug/L	12/06/02	jdn
	1,3-Dichlorobenzene	ND	10	ug/L	12/06/02	jdn
	p-Isopropyltoluene	11	10	ug/L	12/06/02	jdn
	1,4-Dichlorobenzene	45	10	ug/L	12/06/02	jdn
	n-Butylbenzene	ND	10	ug/L	12/06/02	jdn
	1,2-Dichlorobenzene	ND	10	ug/L	12/06/02	jdn
	1,2-Dibromo-3-chloropropane	ND	10	ug/L	12/06/02	jdn
	1,2,4-Trichlorobenzene	ND	10	ug/L	12/06/02	jdn
	Hexachlorobutadiene	ND	10	ug/L	12/06/02	jdn
	Naphthalene	30	10	ug/L	12/06/02	jdn
	1,2,3-Trichlorobenzene	ND	10	ug/L	12/06/02	jdn

* In Description = Dry Wgt.

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LABORATORY TEST RESULTS

Job Number: 213781 Date: 12/12/2002

CUSTOMER: Versar, Inc. PROJECT: SUPPLY SIDE LANDFILL ATTN: Donna Oswald

Customer Sample ID: MW5
Date Sampled.....: 11/25/2002
Time Sampled.....: 11:30
Sample Matrix.....: Water

Laboratory Sample ID: 213781-5
Date Received.....: 11/26/2002
Time Received.....: 09:45

TEST METHOD	PARAMETER/TEST DESCRIPTION	SAMPLE RESULT	REPORTING LIMIT	UNITS	DATE	TECH
350.2	Nitrogen, Ammonia (Dist./Nessler.)					
	Ammonia(NH3+NH4),as N	58	10	mg/L	12/03/02	jmk
9056	Ion Chromatography Analysis					
	Chloride	660	25	mg/L	12/03/02	cvw
	Sulfate	4.3	0.20	mg/L	12/03/02	cvw
420.2	Phenolics, Total Recoverable					
	Phenolics, Total Recoverable	0.32	0.0050	mg/L	11/27/02	kd
150.1	pH (Water)					
	pH	6.46	0.20	pH Units	11/26/02	nrp
160.1	Solids, Total Dissolved (TDS)					
	Solids, Total Dissolved (TDS)	1900	10	mg/L	12/02/02	jmk
415.1	Organic Carbon					
	TOC Average Duplicates	330	25	mg/L	12/06/02	kd
6010B	Metals Analysis (ICAP Trace)					
	Iron	130	0.050	mg/L	12/05/02	tds
	Lead	0.13	0.0050	mg/L	12/05/02	tds
	Manganese	0.89	0.010	mg/L	12/05/02	tds

* In Description = Dry Wgt.

LABORATORY CHRONICLE

Job Number: 213781 Date: 12/12/2002

CUSTOMER: Versar, Inc. PROJECT: SUPPLY SIDE LANDFILL ATTN: Donna Oswald

Lab ID: 213781-1 Client ID: MW4 Date Recvd: 11/26/2002 Sample Date: 11/25/2002

METHOD	DESCRIPTION	RUN#	BATCH#	PREP BT #(S)	DATE/TIME ANALYZED		DILUTION
3010A	Acid Digestion (ICAP)	1	70593		12/03/2002	0450	
9056	Ion Chromatography Analysis	1	70784	70784	12/03/2002	1040	1.00
9056	Ion Chromatography Analysis	1	70784	70784	12/03/2002	1131	5.00
6010B	Metals Analysis (ICAP Trace)	1	71059	70593	12/05/2002	1819	
350.2	Nitrogen, Ammonia (Dist./Nessler.)	1	70633	70633	12/03/2002	0947	50
415.1	Organic Carbon	1	71283	71283	12/06/2002	1408	2
420.2	Phenolics, Total Recoverable	1	70337	70337	11/27/2002	1528	1
160.1	Solids, Total Dissolved (TDS)	1	70630	70630	12/02/2002	1535	
150.1	pH (Water)	1	70217	70217	11/26/2002	1514	

Lab ID: 213781-2 Client ID: MW3 Date Recvd: 11/26/2002 Sample Date: 11/25/2002

METHOD	DESCRIPTION	RUN#	BATCH#	PREP BT #(S)	DATE/TIME ANALYZED		DILUTION
3010A	Acid Digestion (ICAP)	1	70593		12/03/2002	0450	
9056	Ion Chromatography Analysis	1	70784	70784	12/03/2002	1050	1.00
9056	Ion Chromatography Analysis	1	70784	70784	12/03/2002	1141	5.00
6010B	Metals Analysis (ICAP Trace)	1	71059	70593	12/05/2002	1825	
350.2	Nitrogen, Ammonia (Dist./Nessler.)	1	70633	70633	12/03/2002	0948	25
415.1	Organic Carbon	1	71283	71283	12/06/2002	1427	25
420.2	Phenolics, Total Recoverable	1	70337	70337	11/27/2002	1528	1
160.1	Solids, Total Dissolved (TDS)	1	70630	70630	12/02/2002	1537	
150.1	pH (Water)	1	70217	70217	11/26/2002	1515	

Lab ID: 213781-3 Client ID: MW2 Date Recvd: 11/26/2002 Sample Date: 11/25/2002

METHOD	DESCRIPTION	RUN#	BATCH#	PREP BT #(S)	DATE/TIME ANALYZED		DILUTION
3010A	Acid Digestion (ICAP)	1	70593		12/03/2002	0450	
9056	Ion Chromatography Analysis	1	70784	70784	12/03/2002	1222	10.00
6010B	Metals Analysis (ICAP Trace)	1	71059	70593	12/05/2002	1832	5
350.2	Nitrogen, Ammonia (Dist./Nessler.)	1	70633	70633	12/03/2002	0949	50
415.1	Organic Carbon	1	71283	71283	12/06/2002	1600	500
420.2	Phenolics, Total Recoverable	1	70337	70337	11/27/2002	1529	1
160.1	Solids, Total Dissolved (TDS)	1	70630	70630	12/02/2002	1540	
150.1	pH (Water)	1	70217	70217	11/26/2002	1517	

Lab ID: 213781-4 Client ID: MW1 Date Recvd: 11/26/2002 Sample Date: 11/25/2002

METHOD	DESCRIPTION	RUN#	BATCH#	PREP BT #(S)	DATE/TIME ANALYZED		DILUTION
5030B	5030 25 mL Purge Prep	1	71152		12/06/2002	2024	
3010A	Acid Digestion (ICAP)	1	70593		12/03/2002	0450	
9056	Ion Chromatography Analysis	1	70784	70784	12/03/2002	1110	1.00
9056	Ion Chromatography Analysis	1	70784	70784	12/03/2002	1232	20.00
6010B	Metals Analysis (ICAP Trace)	1	71059	70593	12/05/2002	1838	
350.2	Nitrogen, Ammonia (Dist./Nessler.)	1	70633	70633	12/03/2002	0949	50
415.1	Organic Carbon	1	71283	71283	12/06/2002	1617	25
420.2	Phenolics, Total Recoverable	1	70337	70337	11/27/2002	1529	1
160.1	Solids, Total Dissolved (TDS)	1	70630	70630	12/02/2002	1542	
8260B	Volatile Organics	1	71533	71152	12/06/2002	2024	10.0000
150.1	pH (Water)	1	70205	70205	11/26/2002	1450	

Lab ID: 213781-5 Client ID: MW5 Date Recvd: 11/26/2002 Sample Date: 11/25/2002

METHOD	DESCRIPTION	RUN#	BATCH#	PREP BT #(S)	DATE/TIME ANALYZED		DILUTION
3010A	Acid Digestion (ICAP)	1	70593		12/03/2002	0450	
9056	Ion Chromatography Analysis	1	70784	70784	12/03/2002	1121	1.00
9056	Ion Chromatography Analysis	1	70784	70784	12/03/2002	1447	5.00
6010B	Metals Analysis (ICAP Trace)	1	71059	70593	12/05/2002	1844	
350.2	Nitrogen, Ammonia (Dist./Nessler.)	1	70633	70633	12/03/2002	0950	50
415.1	Organic Carbon	1	71283	71283	12/06/2002	1636	25

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LABORATORY CHRONICLE

Job Number: 213781

Date: 12/12/2002

CUSTOMER: Versar, Inc. PROJECT: SUPPLY SIDE LANDFILL ATTN: Donna Oswald

Lab ID: 213781-5 Client ID: MW5 Date Recvd: 11/26/2002 Sample Date: 11/25/2002

METHOD	DESCRIPTION	RUN#	BATCH#	PREP BT #(S)	DATE/TIME ANALYZED		DILUTION
420.2	Phenolics, Total Recoverable	1	70337	70337	11/27/2002	1530	1
160.1	Solids, Total Dissolved (TDS)	1	70630	70630	12/02/2002	1545	
150.1	pH (Water)	1	70217	70217	11/26/2002	1518	

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SURROGATE RECOVERIES REPORT

Job Number.: 213781 Report Date.: 12/12/2002

CUSTOMER: Versar, Inc. PROJECT: SUPPLY SIDE LANDFILL ATTN: Donna Oswald

Method.....: Volatile Organics Test Matrix...: Water Prep Batch..: 71152
Method Code...: 8260B Batch(s).....: 71533

Lab ID	DT	Sample ID	Date	12DCED	BRFLBE	DBRFLM	TOLD8
LCS			12/06/2002	121	108	117	108
MB			12/06/2002	105	102	103	104
213781- 4		MW1	12/06/2002	115	100	109	105

Test	Test Description	Limits
12DCED	1,2-Dichloroethane-d4 (surr)	61 - 131
BRFLBE	4-Bromofluorobenzene (surr)	73 - 122
DBRFLM	Dibromofluoromethane (surr)	66 - 132
TOLD8	Toluene-d8 (surr)	78 - 128

QUALITY CONTROL RESULTS

Job Number.: 213781 — Report Date.: 12/12/2002

CUSTOMER: Versar, Inc. — PROJECT: SUPPLY SIDE LANDFILL — ATTN: Donna Oswald

QC Type	Description	Reag. Code	Lab ID	Dilution Factor	Date	Time
LCS	Laboratory Control Sample	V02L06DSA	71152 -019		12/06/2002	1331

Test Method.....: 8260B — Equipment Code....: GCL9 — Analyst...: jdn
Method Description.: Volatile Organics — Batch.....: 71533

Parameter/Test Description	Units	QC Result	QC Result	True Value	Orig. Value	QC Calc.	*	Limits	F
Dichlorodifluoromethane	ug/L	9.968		10.000	1.000 U	100	%	56-136	
Chloromethane	ug/L	10.379		10.000	1.000 U	104	%	56-129	
Vinyl chloride	ug/L	10.182		10.000	1.000 U	102	%	67-137	
Bromomethane	ug/L	14.053		10.000	1.000 U	141	%	51-152	
Chloroethane	ug/L	11.239		10.000	1.000 U	112	%	68-135	
Trichlorofluoromethane	ug/L	10.996		10.000	1.000 U	110	%	62-141	
1,1-Dichloroethene	ug/L	9.586		10.000	1.000 U	96	%	54-127	
Carbon disulfide	ug/L	9.331		10.000	5.000 U	93	%	29-136	
Acetone	ug/L	7.143		10.000	5.000 U	71	%	43-150	
Methylene chloride	ug/L	10.023		10.000	1.000 U	100	%	52-133	
trans-1,2-Dichloroethene	ug/L	10.032		10.000	1.000 U	100	%	64-119	
Methyl-tert-butyl-ether (MTBE)	ug/L	11.789		10.000	1.000 U	118	%	52-156	
1,1-Dichloroethane	ug/L	11.809		10.000	1.000 U	118	%	69-127	
2,2-Dichloropropane	ug/L	13.032		10.000	1.000 U	130	%	56-141	
cis-1,2-Dichloroethene	ug/L	11.031		10.000	1.000 U	110	%	78-126	
2-Butanone (MEK)	ug/L	10.830		10.000	5.000 U	108	%	54-145	
Bromochloromethane	ug/L	11.470		10.000	1.000 U	115	%	57-133	
Chloroform	ug/L	12.067		10.000	1.000 U	121	%	74-128	
1,1,1-Trichloroethane	ug/L	12.039		10.000	1.000 U	120	%	66-129	
1,1-Dichloropropene	ug/L	10.748		10.000	1.000 U	107	%	70-128	
Carbon tetrachloride	ug/L	10.948		10.000	1.000 U	109	%	66-136	
Benzene	ug/L	10.043		10.000	1.000 U	100	%	74-116	
1,2-Dichloroethane	ug/L	11.940		10.000	1.000 U	119	%	63-133	
Trichloroethene	ug/L	9.369		10.000	1.000 U	94	%	70-120	
1,2-Dichloropropane	ug/L	10.519		10.000	1.000 U	105	%	71-132	
Dibromomethane	ug/L	10.466		10.000	1.000 U	105	%	66-131	
Bromodichloromethane	ug/L	11.476		10.000	1.000 U	115	%	76-129	
cis-1,3-Dichloropropene	ug/L	11.081		10.400	1.000 U	107	%	75-123	
4-Methyl-2-pentanone (MIBK)	ug/L	9.911		10.000	5.000 U	99	%	66-147	
Toluene	ug/L	10.054		10.000	1.000 U	101	%	71-122	
trans-1,3-Dichloropropene	ug/L	10.740		9.600	1.000 U	112	%	76-126	
1,1,2-Trichloroethane	ug/L	11.045		10.000	1.000 U	110	%	69-138	
Tetrachloroethene	ug/L	9.460		10.000	1.000 U	95	%	69-128	
1,3-Dichloropropane	ug/L	10.826		10.000	1.000 U	108	%	71-133	
2-Hexanone	ug/L	9.850		10.000	5.000 U	99	%	70-144	
Dibromochloromethane	ug/L	10.692		10.000	1.000 U	107	%	74-137	
1,2-Dibromoethane (EDB)	ug/L	10.448		10.000	1.000 U	104	%	71-135	
Chlorobenzene	ug/L	10.054		10.000	1.000 U	101	%	76-124	
1,1,1,2-Tetrachloroethane	ug/L	10.662		10.000	1.000 U	107	%	70-134	
Ethylbenzene	ug/L	10.627		10.000	1.000 U	106	%	74-121	
m&p-Xylenes	ug/L	21.562		20.000	2.000 U	108	%	71-125	
o-Xylene	ug/L	10.638		10.000	1.000 U	106	%	72-124	
Styrene	ug/L	10.638		10.000	1.000 U	106	%	80-125	
Bromoform	ug/L	10.261		10.000	1.000 U	103	%	73-139	
Isopropylbenzene	ug/L	11.464		10.000	1.000 U	115	%	67-123	
Bromobenzene	ug/L	10.591		10.000	1.000 U	106	%	77-121	
1,1,2,2-Tetrachloroethane	ug/L	11.332		10.000	1.000 U	113	%	72-127	
1,2,3-Trichloropropane	ug/L	11.933		10.000	1.000 U	119	%	71-126	
n-Propylbenzene	ug/L	11.246		10.000	1.000 U	112	%	67-123	
2-Chlorotoluene	ug/L	11.907		10.000	1.000 U	119	%	69-120	

* %=% REC, R=RPD, A=ABS Diff., D=% Diff.

QUALITY CONTROL RESULTS

Job Number.: 213781 Report Date.: 12/12/2002

CUSTOMER: Versar, Inc. PROJECT: SUPPLY SIDE LANDFILL ATTN: Donna Oswald

QC Type	Description	Reag. Code	Lab ID	Dilution Factor	Date	Time
LCS	Laboratory Control Sample	V02L06DSA	71152 -019		12/06/2002	1331

Parameter/Test Description	Units	QC Result	QC Result	True Value	Orig. Value	QC Calc.	*	Limits	F
1,3,5-Trimethylbenzene	ug/L	11.635		10.000	1.000 U	116	%	69-123	
4-Chlorotoluene	ug/L	11.178		10.000	1.000 U	112	%	68-120	
tert-Butylbenzene	ug/L	11.388		10.000	1.000 U	114	%	69-123	
sec-Butylbenzene	ug/L	11.439		10.000	1.000 U	114	%	69-124	
1,3-Dichlorobenzene	ug/L	10.192		10.000	1.000 U	102	%	73-121	
p-Isopropyltoluene	ug/L	11.439		10.000	1.000 U	114	%	67-126	
1,4-Dichlorobenzene	ug/L	10.242		10.000	1.000 U	102	%	74-121	
n-Butylbenzene	ug/L	11.221		10.000	1.000 U	112	%	71-118	
1,2-Dichlorobenzene	ug/L	10.050		10.000	1.000 U	100	%	74-119	
1,2-Dibromo-3-chloropropane	ug/L	11.834		10.000	1.000 U	118	%	66-123	
1,2,4-Trichlorobenzene	ug/L	8.401		10.000	1.000 U	84	%	77-123	
Hexachlorobutadiene	ug/L	9.520		10.000	1.000 U	95	%	56-147	
Naphthalene	ug/L	6.752		10.000	1.000 U	68	%	69-125	*
1,2,3-Trichlorobenzene	ug/L	7.983		10.000	1.000 U	80	%	75-123	

* %=% REC, R=RPD, A=ABS Diff., D=% Diff.

QUALITY CONTROL RESULTS

Job Number.: 213781 Report Date.: 12/12/2002

CUSTOMER: Versar, Inc. PROJECT: SUPPLY SIDE LANDFILL ATTN: Donna Oswald

QC Type	Description	Reag. Code	Lab ID	Dilution Factor	Date	Time
MB	Method Blank		71152 -018		12/06/2002	1146

Test Method.....: 8260B Equipment Code....: GCL9 Analyst...: jdn
Method Description.: Volatile Organics Batch.....: 71533

Parameter/Test Description	Units	QC Result		QC Result	True Value	Orig. Value	QC Calc.	*	Limits	F
Dichlorodifluoromethane	ug/L	1.000	U							
Chloromethane	ug/L	1.000	U							
Vinyl chloride	ug/L	1.000	U							
Bromomethane	ug/L	1.000	U							
Chloroethane	ug/L	1.000	U							
Trichlorofluoromethane	ug/L	1.000	U							
1,1-Dichloroethene	ug/L	1.000	U							
Carbon disulfide	ug/L	5.000	U							
Acetone	ug/L	5.000	U							
Methylene chloride	ug/L	1.000	U							
trans-1,2-Dichloroethene	ug/L	1.000	U							
Methyl-tert-butyl-ether (MTBE)	ug/L	1.000	U							
1,1-Dichloroethane	ug/L	1.000	U							
2,2-Dichloropropane	ug/L	1.000	U							
cis-1,2-Dichloroethene	ug/L	1.000	U							
2-Butanone (MEK)	ug/L	5.000	U							
Bromochloromethane	ug/L	1.000	U							
Chloroform	ug/L	1.000	U							
1,1,1-Trichloroethane	ug/L	1.000	U							
1,1-Dichloropropene	ug/L	1.000	U							
Carbon tetrachloride	ug/L	1.000	U							
Benzene	ug/L	1.000	U							
1,2-Dichloroethane	ug/L	1.000	U							
Trichloroethene	ug/L	1.000	U							
1,2-Dichloropropane	ug/L	1.000	U							
Dibromomethane	ug/L	1.000	U							
Bromodichloromethane	ug/L	1.000	U							
cis-1,3-Dichloropropene	ug/L	1.000	U							
4-Methyl-2-pentanone (MIBK)	ug/L	5.000	U							
Toluene	ug/L	1.000	U							
trans-1,3-Dichloropropene	ug/L	1.000	U							
1,1,2-Trichloroethane	ug/L	1.000	U							
Tetrachloroethene	ug/L	1.000	U							
1,3-Dichloropropane	ug/L	1.000	U							
2-Hexanone	ug/L	5.000	U							
Dibromochloromethane	ug/L	1.000	U							
1,2-Dibromoethane (EDB)	ug/L	1.000	U							
Chlorobenzene	ug/L	1.000	U							
1,1,1,2-Tetrachloroethane	ug/L	1.000	U							
Ethylbenzene	ug/L	1.000	U							
m&p-Xylenes	ug/L	2.000	U							
o-Xylene	ug/L	1.000	U							
Styrene	ug/L	1.000	U							
Bromoform	ug/L	1.000	U							
Isopropylbenzene	ug/L	1.000	U							
Bromobenzene	ug/L	1.000	U							
1,1,2,2-Tetrachloroethane	ug/L	1.000	U							
1,2,3-Trichloropropane	ug/L	1.000	U							
n-Propylbenzene	ug/L	1.000	U							
2-Chlorotoluene	ug/L	1.000	U							

* %=% REC, R=RPD, A=ABS Diff., D=% Diff.

QUALITY CONTROL RESULTS

Job Number.: 213781 Report Date.: 12/12/2002

CUSTOMER: Versar, Inc. PROJECT: SUPPLY SIDE LANDFILL ATTN: Donna Oswald

QC Type	Description	Reag. Code	Lab ID	Dilution Factor	Date	Time
MB	Method Blank		71152 -018		12/06/2002	1146

Parameter/Test Description	Units	QC Result		QC Result	True Value	Orig. Value	QC Calc.	*	Limits	F
1,3,5-Trimethylbenzene	ug/L	1.000	U							
4-Chlorotoluene	ug/L	1.000	U							
tert-Butylbenzene	ug/L	1.000	U							
1,2,4-Trimethylbenzene	ug/L	1.000	U							
sec-Butylbenzene	ug/L	1.000	U							
1,3-Dichlorobenzene	ug/L	1.000	U							
p-Isopropyltoluene	ug/L	1.000	U							
1,4-Dichlorobenzene	ug/L	1.000	U							
n-Butylbenzene	ug/L	1.000	U							
1,2-Dichlorobenzene	ug/L	1.000	U							
1,2-Dibromo-3-chloropropane	ug/L	1.000	U							
1,2,4-Trichlorobenzene	ug/L	1.000	U							
Hexachlorobutadiene	ug/L	1.000	U							
Naphthalene	ug/L	1.000	U							
1,2,3-Trichlorobenzene	ug/L	1.000	U							

* %=% REC, R=RPD, A=ABS Diff., D=% Diff.

QUALITY CONTROL RESULTS

Job Number.: 213781

Report Date.: 12/12/2002

CUSTOMER: Versar, Inc. PROJECT: SUPPLY SIDE LANDFILL ATTN: Donna Oswald

QC Type	Description	Reag. Code	Lab ID	Dilution Factor	Date	Time

Test Method.....: 6010B
Method Description.: Metals Analysis (ICAP Trace)
Equipment Code....: ICP4
Batch.....: 71059
Analyst...: tds

LCS	Laboratory Control Sample	M02KSPK001	70593 -002		12/05/2002 1813

Parameter/Test Description	Units	QC Result	QC Result	True Value	Orig. Value	QC Calc.	*	Limits	F
Iron	mg/L	0.93261		1.00000	0.03960 U	93	%	80-120	
Lead	mg/L	0.09975		0.10000	0.00290 U	100	%	80-120	
Manganese	mg/L	0.48904		0.50000	0.00071 U	98	%	80-120	

LCS	Laboratory Control Sample	M02KSPK001	70626 -002		12/05/2002 2109

Parameter/Test Description	Units	QC Result	QC Result	True Value	Orig. Value	QC Calc.	*	Limits	F
Iron	mg/L	0.96179		1.00000	0.03960 U	96	%	80-120	
Lead	mg/L	0.10156		0.10000	0.00290 U	102	%	80-120	
Manganese	mg/L	0.50069		0.50000	0.00071 U	100	%	80-120	

* %=% REC, R=RPD, A=ABS Diff., D=% Diff.

QUALITY CONTROL RESULTS

Job Number.: 213781

Report Date.: 12/12/2002

CUSTOMER: Versar, Inc. PROJECT: SUPPLY SIDE LANDFILL ATTN: Donna Oswald

QC Type	Description	Reag. Code	Lab ID	Dilution Factor	Date	Time

Test Method.....: 6010B
Method Description.: Metals Analysis (ICAP Trace)
Equipment Code....: ICP4
Batch.....: 71059
Analyst...: tds

MB	Method Blank	70593	70593 -001		12/05/2002	1807

Parameter/Test Description	Units	QC Result	QC Result	True Value	Orig. Value	QC Calc.	*	Limits	F
Iron	mg/L	0.03960 U							
Lead	mg/L	0.00290 U							
Manganese	mg/L	0.00071 U							

MB	Method Blank	70626	70626 -001		12/05/2002	2103

Parameter/Test Description	Units	QC Result	QC Result	True Value	Orig. Value	QC Calc.	*	Limits	F
Iron	mg/L	0.03960 U							
Lead	mg/L	0.00290 U							
Manganese	mg/L	0.00071 U							

* %=% REC, R=RPD, A=ABS Diff., D=% Diff.

QUALITY CONTROL RESULTS

Job Number.: 213781 Report Date.: 12/12/2002

CUSTOMER: Versar, Inc. PROJECT: SUPPLY SIDE LANDFILL ATTN: Donna Oswald

Test Method.....: 350.2 Batch.....: 70633 Analyst...: jmk
Method Description.: Nitrogen, Ammonia (Dist./Nessler.) Equipment Code....: Test Code.: NH3
Parameter.....: Ammonia(NH3+NH4),as N

QC	Lab ID	Reagent	Units	QC Result	QC Result	True Value	Orig. Value	QC Calc.	F	*	Limits	Date	Time
MB	70633 -004		mg/L	0.11000 U								12/03/2002	0933
LCS	70633 -005	I02KSTTK2	mg/L	2.44400		2.50000		98		%	80-120	12/03/2002	0934

Test Method.....: 9056 Batch.....: 70784 Analyst...: cvw
Method Description.: Ion Chromatography Analysis Equipment Code....: IC4 Test Code.: CHL
Parameter.....: Chloride

QC	Lab ID	Reagent	Units	QC Result	QC Result	True Value	Orig. Value	QC Calc.	F	*	Limits	Date	Time
MB	70784 -004		mg/L	0.12400 U								12/03/2002	1008
LCS	70784 -005	I02LINIC1B	mg/L	50.54590		50.00000	3.10000 U	101		%	80-120	12/03/2002	1019
LCS	70784 -006	I02LINIC1A	mg/L	3.12920		3.00000		104		%	80-120	12/03/2002	1029
MS	213781-1	I02LINIC1B	mg/L	813.88600		2500.00000	316.13650	100		%	75-125	12/03/2002	1457
MSD	213781-1	I02LINIC1B	mg/L	814.97000	813.88600	2500.00000	316.13650	100		%	75-125	12/03/2002	1508
								0.0		R	20		

before 5x dil'n

Test Method.....: 9056 Batch.....: 70784 Analyst...: cvw
Method Description.: Ion Chromatography Analysis Equipment Code....: IC4 Test Code.: SO4
Parameter.....: Sulfate

QC	Lab ID	Reagent	Units	QC Result	QC Result	True Value	Orig. Value	QC Calc.	F	*	Limits	Date	Time
MB	70784 -004		mg/L	0.04900 U								12/03/2002	1008
LCS	70784 -005	I02LINIC1B	mg/L	48.56740		50.00000	1.22500 U	97		%	80-120	12/03/2002	1019
LCS	70784 -006	I02LINIC1A	mg/L	5.33530		5.00000		107		%	80-120	12/03/2002	1029
MS	213781-1	I02LINIC1A	mg/L	56.34800		250.00000	4.57050	104		%	75-125	12/03/2002	1457
MSD	213781-1	I02LINIC1A	mg/L	56.67900	56.34800	250.00000	4.57050	104		%	75-125	12/03/2002	1508
								0.0		R	20		

before 5x dil'n

Test Method.....: 420.2 Batch.....: 70337 Analyst...: kd
Method Description.: Phenolics, Total Recoverable Equipment Code....: LACHAT1 Test Code.: PHENTR
Parameter.....: Phenolics, Total Recoverable

QC	Lab ID	Reagent	Units	QC Result	QC Result	True Value	Orig. Value	QC Calc.	F	*	Limits	Date	Time
MB	70337 -004		mg/L	0.00330 U								11/27/2002	1526
LCS	70337 -005	I02KSTPE2	mg/L	0.09340		0.10000		93		%	80-120	11/27/2002	1526

Test Method.....: 160.1 Batch.....: 70630 Analyst...: jmk
Method Description.: Solids, Total Dissolved (TDS) Equipment Code....: Test Code.: TDS
Parameter.....: Solids, Total Dissolved (TDS)

QC	Lab ID	Reagent	Units	QC Result	QC Result	True Value	Orig. Value	QC Calc.	F	*	Limits	Date	Time
MB	70630 -001		mg/L	4.80000 U								12/02/2002	1530
LCS	70630 -002	I02KSTTS1A	mg/L	236.00000		250.00000		94		%	80-120	12/02/2002	1532

* %=% REC, R=RPD, A=ABS Diff., D=% Diff.

QUALITY CONTROL RESULTS

Job Number.: 213781 Report Date.: 12/12/2002

CUSTOMER: Versar, Inc. PROJECT: SUPPLY SIDE LANDFILL ATTN: Donna Oswald

Test Method.....: 415.1 Batch.....: 71283 Analyst...: kd
Method Description.: Organic Carbon Equipment Code....: TOC3 Test Code.: TOCAV2
Parameter.....: TOC Average Duplicates

QC	Lab ID	Reagent	Units	QC Result	QC Result	True Value	Orig. Value	QC Calc. F	*	Limits	Date	Time
MB	71283 -004		mg/L	0.57000 B							12/06/2002	0958
LCS	71283 -005	I02KSTTC2B	mg/L	5.09800		5.00000		102	%	80-120	12/06/2002	1014

* %=% REC, R=RPD, A=ABS Diff., D=% Diff.

QUALITY ASSURANCE METHODS

REFERENCES AND NOTES

Report Date: 12/12/2002

REPORT COMMENTS

1) All pages of this report are integral parts of the analytical data. Therefore, this report should be reproduced only in its entirety.
2) Soil, sediment and sludge sample results are reported on a "dry weight" basis except when analyzed for landfill disposal or incineration parameters. All other solid matrix samples are reported on an "as received" basis unless noted differently.
3) Reporting limits are adjusted for sample size used, dilutions and moisture content if applicable.
4) The test results for the noted analytical method(s) meet the requirements of NELAC. Lab Cert. ID# 100201
5) Arizona Environmental Laboratory License number AZ0603.
6) According to 40CFR Part 136.3, pH, Chlorine Residual and Dissolved Oxygen analyses are to be performed immediately after aqueous sample collection. When these parameters are not indicated as field (e.g. pH Field) they were not analyzed immediately, but as soon as possible on laboratory receipt.

Glossary of flags, qualifiers and abbreviations (any number of which may appear in the report)

Inorganic Qualifiers (Q-Column)

U	Analyte was not detected at or above the stated limit.
<	Not detected at or above the reporting limit.
J	Result is less than the RL, but greater than or equal to the method detection limit.
B	Result is less than the CRDL/RL, but greater than or equal to the IDL/MDL.
S	Result was determined by the Method of Standard Additions.
F	AFCEE: Result is less than the RL, but greater than or equal to the method detection limit.

Inorganic Flags (Flag Column)

^	ICV,CCV,ICB,CCB,ISA,ISB,CRI,CRA,MRL: Instrument related QC exceed the upper or lower control limits.
*	LCS, LCD, MD: Batch QC exceeds the upper or lower control limits.
+	MSA correlation coefficient is less than 0.995.
4	MS, MSD: The analyte present in the original sample is 4 times greater than the matrix spike concentration; therefore, control limits are not applicable.
E	SD: Serial dilution exceeds the control limits.
H	MB, EB1, EB2, EB3: Batch QC is greater than reporting limit or had a negative instrument reading lower than the absolute value of the reporting limit.
N	MS, MSD: Spike recovery exceeds the upper or lower control limits.
W	AS(GFAA) Post-digestion spike was outside 85-115% control limits.

Organic Qualifiers (Q - Column)

U	Analyte was not detected at or above the stated limit.
ND	Compound not detected.
J	Result is an estimated value below the reporting limit or a tentatively identified compound (TIC).
Q	Result was qualitatively confirmed, but not quantified.
C	Pesticide identification was confirmed by GC/MS.
Y	The chromatographic response resembles a typical fuel pattern.
Z	The chromatographic response does not resemble a typical fuel pattern.
E	Result exceeded calibration range, secondary dilution required.
F	AFCEE:Result is an estimated value below the reporting limit or a tentatively identified compound (TIC)

Organic Flags (Flags Column)

B	MB: Batch QC is greater than reporting limit.
*	LCS, LCD, ELC, ELD, CV, MS, MSD, Surrogate: Batch QC exceeds the upper or lower control limits.
^	EB1, EB2, EB3, MLE: Batch QC is greater than reporting Limit
A	Concentration exceeds the instrument calibration range
a	Concentration is below the method Reporting Limit (RL)
B	Compound was found in the blank and sample.
D	Surrogate or matrix spike recoveries were not obtained because the extract was diluted for analysis; also compounds analyzed at a dilution will be flagged with a D.
H	Alternate peak selection upon analytical review
I	Indicates the presence of an interfence, recovery is not calculated.
M	Manually integrated compound.

P The lower of the two values is reported when the % difference between the results of two GC columns is greater than 25%.

Abbreviations

AS	Post Digestion Spike (GFAA Samples - See Note 1 below)
Batch	Designation given to identify a specific extraction, digestion, preparation set, or analysis set
CAP	Capillary Column CCB Continuing Calibration Blank
CCV	Continuing Calibration Verification
CF	Confirmation analysis of original
C1	Confirmation analysis of A1 or D1
C2	Confirmation analysis of A2 or D2
C3	Confirmation analysis of A3 or D3
CRA	Low Level Standard Check - GFAA; Mercury
CRI	Low Level Standard Check - ICP
CV	Calilbration Verification Standard
Dil Fac	Dilution Factor - Secondary dilution analysis
D1	Dilution 1
D2	Dilution 2
D3	Dilution 3
DLFac	Detection Limit Factor
DSH	Distilled Standard - High Level
DSL	Distilled Standard - Low Level
DSM	Distilled Standard - Medium Level
EB1	Extraction Blank 1
EB2	Extraction Blank 2
EB3	DI Blank
ELC	Method Extracted LCS
ELD	Method Extracted LCD
ICAL	Initial calibration
ICB	Initial Calibration Blank
ICV	Initial Calibration Verification
IDL	Instrument Detection Limit
ISA	Interference Check Sample A - ICAP
ISB	Interference Check Sample B - ICAP
Job No.	The first six digits of the sample ID which refers to a specific client, project and sample group
	Lab ID An 8 number unique laboratory identification
LCD	Laboratory Control Standard Duplicate
LCS	Laboratory Control Standard with reagent grade water or a matrix free from the analyte of interest
MB	Method Blank or (PB) Preparation Blank
MD	Method Duplicate
MDL	Method Detection Limit
MLE	Medium Level Extraction Blank
MRL	Method Reporting Limit Standard
MSA	Method of Standard Additions
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ND	Not Detected
PREPF	Preparation factor used by the Laboratory's Information Management System (LIMS)
PDS	Post Digestion Spike (ICAP)
RA	Re-analysis of original
A1	Re-analysis of D1
A2	Re-analysis of D2
A3	Re-analysis of D3
RD	Re-extraction of dilution
RE	Re-extraction of original
RC	Re-extraction Confirmation
RL	Reporting Limit
RPD	Relative Percent Difference of duplicate (unrounded) analyses
RRF	Relative Response Factor

QUALITY ASSURANCE METHODS

REFERENCES AND NOTES

Report Date: 12/12/2002

RT	Retention Time
RTW	Retention Time Window Sample ID A 9 digit number unique for each sample, the first six digits are referred as the job number
SCB	Seeded Control Blank
SD	Serial Dilution (Calculated when sample concentration exceeds 50 times the MDL)
UCB	Unseeded Control Blank
SSV	Second Source Verification Standard
SLCS	Solid Laboratory Control Standard(LCS)
PHC	pH Calibration Check LCSP pH Laboratory Control Sample
LCDP	pH Laboratory Control Sample Duplicate
MDPH	pH Sample Duplicate
MDFP	Flashpoint Sample Duplicate
LCFP	Flashpoint LCS
G1	Gelex Check Standard Range 0-1
G2	Gelex Check Standard Range 1-10
G3	Gelex Check Standard Range 10-100
G4	Gelex Check Standard Range 100-1000

Note 1: The Post Spike Designation on Batch QC for GFAA is designated with an "S" added to the current abbreviation used. EX. LCS S=LCS Post Spike (GFAA); MSS=MS Post Spike (GFAA)
Note 2: The MD calculates an absolute difference (A) when the sample concentration is less than 5 times the reporting limit. The control limit is represented as +/- the RL.

SEVERN TRENT SERVICES

STL Chicago
2417 Bond Street
University Park, IL 60466
Phone: 708-534-5200
Fax: 708-534-5211

Report To:
Contact: DONNA OSWALD
Company: VERSAR
Address: 200 W 22nd St. Ste 250
Lombard, IL 60148
Phone: 630-268-8555 x230
Fax: 630-268-0555
E-Mail: OSwaldon@Versar.com

Bill To:
Contact:
Company: Same
Address:
Phone:
Fax:
PO#: Quote:

Shaded Areas For internal Use Only ____ of ____

Lab Lot# 213781

Package Sealed (Yes) No	Samples Sealed Yes (No)
Received on Ice (Yes) No	Samples Intact (Yes) No
Temperature °C of Cooler: 3.8	

Sampler Name: T Feudenrich
Signature:
Project Name: Supply Side Landfill
Project Number:
Project Location: GREAT LAKES NTC
Lab PM:
Date Required
Hard Copy: ___/___/___
Fax: ___/___/___

Within Hold Time (Yes) No	Preserv. Indicated (Yes) No NA
pH Check OK (Yes) No NA	Res Cl_2 Check OK (Yes) No NA
Sample Labels and COC Agree (Yes) No	COC not present

Laboratory ID	MS-MSD	Client Sample ID	Sampling Date	Sampling Time	Matrix	Comp/Grab	Refrg.#	# / Cont.	Volume	Preserv.	Rhenols	Iron, Manganese, Lead	Ammonia, TOC	pH, TDS, Chloride, Sulfate	TOC	VOA	Additional Analyses / Remarks
									500	1000	1000	1000	40	40			
1		MW4	11/25	8:30AM	H_2O	✓					1	1	1	1	2	Ø	GRAY TURBID
2		MW3	11/25	9:45AM	H_2O	✓					1	1	1	1	2	Ø	BROWN SEDIMENTS TURBID
3		MW2	11/25	10:15AM	H_2O	✓					1	1	1	1	2	Ø	OPAQUE/SOUR ODOR
4		MW1	11/25	10:45AM	H_2O	✓					1	1	1	1	2	3	REACTION TO H_2SO_4 PRESERVATIVE
5		MW5	11/25	11:30AM	H_2O	✓					1	1	1	1	2	Ø	REACTION TO H_2SO_4 PRESERVATIVE

RELINQUISHED BY	COMPANY	DATE 11/25/02	TIME 4:00
RECEIVED BY	COMPANY STL	DATE 11/26/02	TIME 0945
RELINQUISHED BY	COMPANY	DATE	TIME
RECEIVED BY	COMPANY	DATE	TIME

Matrix Key
WW = Wastewater, W = Water, S = Soil, SL = Sludge, MS = Miscellaneous, OL = Oil, A = Air, SE = Sediment, SO = Solid, DS = Drum Solid, DL = Drum Liquid, L = Leachate, WI = Wipe, O = _____

Container Key
1. Plastic
2. VOA Vial
3. Sterile Plastic
4. Amber Glass
5. Widemouth Glass
6. Other _____

Preservative Key
1. HCl, Cool to 4°
2. H2SO4, Cool to 4°
3. HNO3, Cool to 4°
4. NaOH, Cool to 4°
5. NaOH/Zn, Cool to 4°
6. Cool to 4°
7. None

COMMENTS
NOTE: VOLATILATION OF SAMPLES DURING FIELD BOTTLING @ MW1 & MW5 see Remarks

Date Received 11 / 26 / 02
Courier: Fed Ex
Hand Delivered ☐
Bill of Lading 7901 4815 4979

APPENDIX D

SURFACE WATER DATA

Surface Water Monitoring Data (1985-1996)
SUPPLY SIDE LANDFILL

S101 (UPSTREAM)

Sampling Date	Ammonia	Chloride	Sulfate	TDS	TOC	Phenolics	Iron	Lead	Manganese	pH
27-Feb-85	**19**	337	61.4	660	22	0.00125	0.81	<0.1	<0.1	6.5
27-Aug-85	0.1	175	132.2	744	17	0.0063	0.59	<0.1	0.1	7
19-Nov-85	0.4	29	34	245	10	**0.93**	**1.3**	<0.1	<0.1	7
24-Feb-86	0.78	**1360**	127	**2620**	76	0.0025	**5.2**	0.043	**2.2**	7.8
7-Jul-86	0.88	152	90	600	6	0.021	0.08	0.02	0.01	7
26-Aug-86	3.2	55	25	310	15	<0.001	1	<0.05	<0.1	7.8
24-Nov-86	<1	213	170	1000	<5	<0.010	<.2	<.2	<.2	7.4
26-Feb-87	<0.1	255	225	**1045**	157	**0.2**	<0.3	<0.3	<0.2	8.1
19-May-87	0.08	258	5.5	870	7	<0.010	<0.3	<0.2	<0.2	7.4
20-Aug-87	1.2	111	1	302	7.5	0.0025	<0.2	<0.2	<0.2	7.1
30-Nov-87	0.08	241	9.5	655	6	<0.01	<0.2	<0.2	<0.2	7.5
28-Feb-88	<5	**567.2**	5.5	**1105**	5	**2.3**	<0.2	NA	<0.2	7.5
28-May-88	<0.1	442	6	500	19	<0.1	**3.4**	<0.2	<0.2	7.5
1-Sep-88	0.73	116	14.12	770	6.5	<0.1	<0.2	<0.5	<0.2	8
30-Nov-88	<0.5	**2181**	16	**1016**	34.8	<0.5	<0.2	<0.2	<0.2	7.3
28-Feb-89	1	**525**	11.7	**1310**	10	0.0066	0.21	0.23	0.15	7.8
31-May-89	2.1	42.5	**515**	804	37.42	**1**	0.42	0.1	<0.05	8
31-Aug-89	1.5	150	140	740	8.5	<1	0.44	0.03	0.08	7.5
30-Nov-89	1.5	500	168	**1500**	31.1	<1	0.15	0.33	0.08	7.5
28-Feb-90	2.5	**741**	144	**2540**	6	<1	0.03	0.07	0.02	7.5
29-May-90	0.5	128	15	570	8.33	<1	0.04	0.1	<0.01	7.5
28-Aug-90	6.7	3.6	<1	230	37.5	<1	0.3	0.07	0.03	7
30-Nov-90	4	71	6.7	710	12	<1	0.66	0.039	0.01	7.5
26-Feb-91	<1	365	117	**2540**	6.3	<1	0.2	0.04	0.03	8.2
31-May-91	3.18	213	72.2	480	12.4	<1	0.16	0.03	0.01	8.2
30-Aug-91	0.23	199	300	980	21.5	**2.73**	**1.29**	0.02	0.14	8.19
26-Nov-91	14.5	225	**540**	**1600**	102	<1	0.03	0.05	0.08	6.92
28-Feb-92	1.36	60	135	**1110**	12.5	<1	0.08	<0.01	0.02	9
28-May-92	1.3	375	150	**107000**	7.4	<1	0.04	0.03	<0.1	7.24
31-Aug-92	0.7	210	60	644	8.74	<1	0.26	<0.01	<0.01	8.2
30-Dec-92	0.3	160	73	590	6.2	<1	0.14	0.07	<0.01	7.63
25-Feb-93	4.6	**823**	190	**1990**	7.4	<1	0.18	0.04	0.11	7.2
21-May-93	0.24	295	400	**1100**	7.5	<1	0.75	<0.05	0.18	7.3
31-Aug-93	0.21	95.3	32	410	8.21	<0.2	**4.83**	<0.050	0.07	7.4
7-Mar-94	NA	220	58	500	6.8	<0.1	**2.9**	0.0092	0.14	7.6
16-May-94	0.19	310	120	970	18	<0.03	**1.4**	0.011	0.34	8.3
15-Jul-94	<0.1	180	120	1000	14	<0.03	**1.5**	<0.005	0.23	7.8
23-Sep-94	0.24	260	120	780	16	<0.03	0.62	0.0066	0.11	7.8
24-Feb-95	0.3	370	120	870	6.1	<0.03	0.89	0.011	0.2	7.9
5-May-95	0.17	150	60	420	NA	<0.03	**2.1**	0.016	0.09	8.2
10-Jul-95	1.5	280	93	850	18	<0.1	0.63	<0.0075	0.13	7.8
5-Oct-95	0.17	190	110	640	18	<0.03	0.71	0.71	0.19	7.8
1-May-96	<.10	44	84	1000	8	**0.16**	0.8	<0.05	0.065	8.1
24-Jun-96	0.29	7	52	36	8.3	<0.03	0.73	<0.005	0.15	7.6
17-Sep-96	0.34	150	93	760	6.2	<0.03	0.41	<0.005	0.045	8.3
19-Nov-96	0.15	200	68	670	6.5	<0.03	0.71	<0.005	0.13	8
Ave	1.7	305.1	110.7	3212.7	19.3	0.3	0.8	0.07	0.1	
Max	19	2181	540	107000	157	2.73	5.2	0.71	2.2	
General Use Water Quality Standards	15	500	500	1000	NA	0.1	1	*	1	6.5-9.0

Concentrations in mg/L

Bold and Shaded = Exceeds Water Quality Standard

General Use Water Quality Standards (Title 35, Part 302, Subpart B)

Lead standard based on hardness calculation

Surface Water Monitoring Data (1985-1996)
SUPPLY SIDE LANDFILL

S301 (DOWNSTREAM)

Sampling Date	Ammonia	Chloride	Sulfate	TDS	TOC	Phenolics	Iron	Lead	Manganese	pH
27-Feb-85	**18.9**	337	64.2	692	29	0.00156	0.8	<0.1	<0.1	6.7
27-Aug-85	0.1	169	113.2	804	20	<0.00313	0.51	<0.1	0.14	7
19-Nov-85	0.33	39	48	280	15	0.00364	**1.31**	<0.1	0.14	7
24-Feb-86	0.75	**973**	108	**1956**	13	<0.001	**5.2**	0.041	**1.9**	7.7
7-Jul-86	0.8	150	101	465	16	<0.019	0.06	0.01	0.01	7
26-Aug-86	**34.6**	82	35	400	15	<0.001	<0.1	<0.05	<0.1	7.8
24-Nov-86	<1	354	146	820	<5	<0.01	<.2	<.2	<0.2	8.3
26-Feb-87	<0.1	200	155	910	12	0.025	<0.3	<0.3	<0.2	8
19-May-87	0.02	282	5.5	840	7	<0.01	<0.3	<0.2	<0.2	7.5
20-Aug-87	1.08	99	5.5	302	9.1	0.01	<0.2	<0.2	<0.2	7.3
30-Nov-87	<0.02	268	4.3	675	9	<0.01	<0.2	<0.2	<0.2	7.8
28-Feb-88	<5	**666.5**	7.5	969	6	**3.8**	<0.2	<0.2	NA	7.8
28-May-88	<0.1	419	<0.1	550	18	<0.1	**5.8**	<0.2	<0.2	7.8
1-Sep-88	0.48	61	9.41	320	3.2	<0.1	<0.2	<0.5	<0.2	7.4
30-Nov-88	<0.5	**1980**	10	940	44.4	<0.5	<0.2	<0.2	<0.2	7.3
28-Feb-89	1	460	10.6	**1290**	9.8	0.0049	0.16	0.25	0.17	8.1
31-May-89	1.57	312	476	976	38.93	<1	<0.05	<0.05	<0.05	8.8
31-Aug-89	1.3	170	52	760	8.4	0.1	0.13	<0.01	0.01	7.1
30-Nov-89	1.5	408	156	**1300**	19.95	<1	0.05	0.34	0.05	7.5
28-Feb-90	1.2	**943**	123	**2070**	5.7	<1	0.04	0.19	0.03	7.7
29-May-90	0.5	140	15	650	8.54	<1	0.11	0.12	<0.01	7.8
28-Aug-90	7.7	110	<1	230	20	<1	0.1	0.1	<0.01	6.8
30-Nov-90	4	64	15	840	15	<1	0.77	0.058	0.016	7.5
26-Feb-91	<1	300	130	**2440**	5.3	<1	0.3	0.05	0.07	7.9
31-May-91	<1	156	33.3	380	13.4	<1	0.15	0.03	0.01	7.9
30-Aug-91	0.68	213	180	930	30.2	**3.37**	**4.97**	0.04	**1.71**	7.61
26-Nov-91	0.3	5.7	340	560	40	<1	0.06	0.02	0.09	7.47
28-Feb-92	1.81	313	79	**1070**	11.1	<1	0.08	<0.01	0.01	8
28-May-92	0.64	**569**	160	**94000**	7.53	<1	0.09	0.07	<0.1	6.6
31-Aug-92	0.7	200	250	637	7.75	<1	0.19	0.01	0.01	7.6
20-Dec-92	0.6	110	53	410	4.9	<1	0.24	0.04	<0.01	7.24
25-Feb-93	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
21-May-93	0.95	310	130	**1240**	8.1	<1	0.48	<0.05	0.15	7.5
31-Aug-93	<0.1	77.4	31.8	390	9.63	<0.2	**3.35**	0.06	0.07	7
7-Mar-94	0.22	250	59	930	6.7	<0.1	**1.5**	<0.005	<0.1	7.6
16-May-94	0.17	180	77	680	14	<0.03	0.7	0.0085	<.10	8.2
15-Jul-94	0.18	120	85	690	16	<0.03	0.78	<0.005	0.11	7.8
23-Sep-94	0.2	110	85	420	11	<0.03	0.42	<0.005	<0.05	7.7
24-Feb-95	0.21	300	94	70	NA	<0.03	0.84	0.013	0.15	8
5-May-95	0.19	140	60	470	23	<0.03	0.91	<0.005	0.073	8.2
10-Jul-95	0.88	170	70	700	10	<0.1	0.36	<0.0075	0.14	7.9
5-Oct-95	0.12	170	96	630	23	<0.03	0.29	<0.005	0.061	8
1-May-96	<0.10	29	83	870	3.4	<0.03	0.83	<0.05	0.066	8.2
24-Jun-96	0.32	5	51	400	5.8	**0.46**	0.83	<0.005	0.16	7.9
17-Sep-96	0.6	140	93	720	5.9	<0.03	0.8	<0.005	0.081	8.1
19-Nov-96	0.16	220	70	710	200	<0.03	0.85	<.005	0.19	7.9
Ave	1.9	283.9	88.2	2853.0	18.2	0.7	0.8	0.06	0.2	
Max	34.6	1980	476	94000	200	10	5.8	0.34	1.9	
General Use Water Quality Standards	15	500	500	1000	NA	0.1	1	*	1	6.5-9.0

Concentrations in mg/L

Bold and Shaded = Exceeds Water Quality Standard

General Use Water Quality Standards (Title 35, Part 302, Subpart B)

Lead standard based on hardness calculation

APPENDIX E

GROUNDWATER MONITORING DATA (1983-1996)

Quarterly Groundwater Monitoring Data (1983-1996)
SUPPLY SIDE LANDFILL

G101

Sampling Date	Ammonia	Chloride	Sulfate	TDS	TOC	Phenolics	Iron	Lead	Manganese	pH	Depth to Water	Comments
22-Nov-83	0.11	64	285	NA	43	<0.01	0.2	<0.1	0.16	NA	NA	
1-Mar-84	<0.1	622	323	NA	50	0.013	0.2	0.05	0.19	NA	NA	
27-Feb-85	22.8	386	50.36	1444	14	0.0075	<0.1	<0.1	<0.1	6.2	5	
27-Aug-85	0.15	149	236.7	1060	228	<0.00313	<0.1	<0.1	0.46	6.9	6	
19-Nov-85	0.4	70	267	830	23	0.00352	0.16	<0.1	<0.1	7	3	
24-Feb-86	0.26	78	206	943	27	0.002	1.2	0.017	1.6	7.7	2.75	
7-Jul-86	0.64	127	150	785	11	<0.019	0.1	0.1	0.01	7	4	
26-Aug-86	30	29	137	2340	9	<0.001	3	<0.05	<0.1	9.7	NA	
24-Nov-86	2	284	580	1420	<5	<0.01	<.2	<.2	<.2	7.2	NA	
26-Feb-87	<0.1	33	16	265	14	<0.01	<0.3	<.03	<0.3	10.2	NA	
19-May-87	0.03	101	5.5	820	11	0.05	<0.3	<0.2	<0.2	7.2	NA	
20-Aug-87	264	252	7.4	1738	128	<0.0025	<0.2	<0.2	<0.2	7	NA	
30-Nov-87	0.02	515	6.4	1780	42	<0.01	<0.2	<0.2	<0.2	7.4	NA	
28-Feb-88	<5	90.8	5.5	612	10	3.8	<0.2	NA	<0.2	7.3	NA	
28-May-88	<0.1	218	5.5	1820	15	0.3	3.4	<0.2	<0.2	7.3	NA	
1-Sep-88	0.42	105	44.71	1320	32.3	<0.1	<0.2	<0.5	<0.2	7	NA	
30-Nov-88	<0.5	803	26	1028	8.3	<0.5	<0.2	<0.2	<0.2	7.1	NA	
28-Feb-89	<1	82	18.3	785	23.1	8.5	1	0.00035	1.34	7.7	NA	
31-May-89	2	284.1	345	580	36.52	<1	<0.05	0.14	<0.05	8.1	NA	
31-Aug-89	1.8	170	200	1140	21	<1	0.31	0.01	0.01	6.9	NA	
30-Nov-89	2	95.7	562	1480	47.44	<1	0.03	0.01	0.01	7.5	NA	
28-Feb-90	1.8	92.2	320	1680	15.4	<1	0.08	0.06	0.7	8.2	NA	
29-May-90	0.9	28.5	150	700	15.2	<1	0.15	<0.01	0.01	7	NA	
28-Aug-90	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
30-Nov-90	0.6	57	387	1780	32	<1	0.02	0.26	0.032	7.7	NA	
26-Feb-91	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
31-May-91	1.8	142	222	590	14.2	<1	0.16	0.03	0.03	7.8	NA	
30-Aug-91	7.23	142	350	1560	29.5	<1	3.1	0.05	0.11	8.64	NA	
26-Nov-91	0.6	35.5	130	500	109	<1	0.02	0.01	<0.01	7.68	NA	
28-Feb-92	0.9	35	230	960	26.9	<1	0.04	0.12	<0.01	7.5	NA	
28-May-92	<0.5	24	135	54000	11.73	<1	0.09	0.14	0.6	7.21	NA	
31-Aug-92	0.7	72.1	290	882	25.8	<1	1.95	0.02	0.38	7.8	NA	
30-Dec-92	0.2	53	220	740	18	<1	0.13	0.11	0.02	7.23	NA	
25-Feb-93	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
21-May-93	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
31-Aug-93	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
7-Mar-94	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Frozen Well.
16-May-94	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Obstructed well
15-Jul-94	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Obstructed well
23-Sep-94	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Obstructed well
24-Feb-95	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Obstructed well
5-May-95	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Obstructed well
10-Jul-95	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Obstructed well
5-Oct-95	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Obstructed well
1-May-96	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Obstructed well
24-Jun-96	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Obstructed well
17-Sep-96	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Obstructed well
19-Nov-96	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Obstructed well
Ave	11.1	169.0	190.7	2951.1	35.3	0.7	0.5	0.08	0.2			
Max	264	803	580	54000	228	8.5	3.4	0.26	1.6			
Class I GQS (mg/L)	NS	200	400	1200	NS	0.1	5	0.0075	0.15	6.5-9.0		
Class II GQS (mg/L)	NS	200	400	1200	NS	0.1	5	0.1	10	6.5-9.0		

Concentrations in mg/L

Bold and Shaded = Exceeds Class I Groundwater Quality Standard (GQS)

Class I and Class II Groundwater Quality Standards (Title 35, Part 620, Subpart D)

NA=Not Available

NS=No Standard established by IEPA

Quarterly Groundwater Monitoring Data (1983-1996)
SUPPLY SIDE LANDFILL

G102

Sampling Date	Ammonia	Chloride	Sulfate	TDS	TOC	Phenolics	Iron	Lead	Manganese	pH	Depth to Water
18-Jul-83	13	127	155	NA	11	0.04	<0.1	0.01	0.1	NA	NA
22-Nov-83	16.8	147	151	NA	48	0.01	0.5	<0.1	0.04	NA	NA
1-Mar-84	16.5	153	208	NA	111	0.032	0.3	0.05	0.06	NA	NA
27-Feb-85	28.8	289	351.2	1512	40	0.01857	<0.1	<0.12	0.61	6.5	5
27-Aug-85	13.4	136	443.2	1884	30	<0.00313	0.15	<0.1	0.1	7.1	7
19-Nov-85	15.5	142	350	1540	35	0.0055	0.1	<0.1	0.18	7	5
24-Feb-86	63.1	127	515	1550	17	0.004	14	<.01	1	7.3	6.75
7-Jul-86	11.25	132	350	1870	10	0.029	0.05	0.01	0.02	7	10
26-Aug-86	13	135	40	2000	17	<0.001	1	<0.05	<0.1	7.2	NA
24-Nov-86	10	495	440	1520	<5	<0.01	<.2	<.2	<.2	7.1	NA
26-Feb-87	0.1	130	400	1450	25	0.2	<0.3	<0.3	<0.2	7.7	NA
19-May-87	0.14	167	9.5	1350	16	0.1	<0.3	<0.2	<0.2	7.2	NA
20-Aug-87	14.4	173	5.5	1380	40	0.0175	<0.2	<0.2	<0.2	7.1	NA
30-Nov-87	<0.02	294	5.5	1740	21	<0.01	<0.2	<0.2	<0.2	7.1	NA
28-Feb-88	30	425.4	13.5	1730	17	3.4	<0.2	NA	<0.2	6.9	NA
28-May-88	<0.1	196	13.7	1835	36	0.3	5	<0.2	<0.2	6.9	NA
1-Sep-88	0.73	NA	70.59	1835	16.6	<0.1	<0.2	<0.5	<0.2	6.6	NA
30-Nov-88	2.5	1418	26	1376	14	<0.5	<0.2	<0.2	<0.2	7.3	NA
28-Feb-89	1	46	20	1570	26.5	0.0054	5.33	0.26	0.16	7.3	NA
31-May-89	14.4	184	1760	1670	46.65	<1	<0.05	0.2	<0.05	7.6	NA
31-Aug-89	9.2	160	360	2210	21.8	<1	0.45	0.09	0.08	7	NA
30-Nov-89	8	195	475	1950	93.36	<1	0.76	0.08	0.11	7.3	NA
28-Feb-90	6.5	56.7	224	2000	19.6	<1	1.2	0.22	0.03	8.2	NA
29-May-90	15	184	16	1300	44.8	<1	2.3	<0.01	0.16	7	NA
28-Aug-90	16	240	140	1370	50.3	<1	0.95	0.01	0.01	7.1	NA
30-Nov-90	2	235	387	1700	39	<1	2.31	<0.01	0.24	7.2	NA
26-Feb-91	21.9	288	341	1640	25.6	<1	1.3	0.07	0.12	7.6	NA
31-May-91	1.5	220	389	1680	25.6	<1	0.38	0.04	0.14	7.1	NA
30-Aug-91	2	49.6	286	900	21.9	5.25	2.78	0.03	1.1	8.5	NA
26-Nov-91	0.9	184	210	510	37.9	<1.0	0.11	0.1	0.03	7.73	NA
28-Feb-92	13.63	282	115	1850	65.8	<1	0.1	0.1	0.02	7.2	NA
28-May-92	9.03	464	440	145000	21.9	<1	0.06	0.06	0.04	6.89	NA
31-Aug-92	9.5	276	270	1600	22.1	<1	0.11	0.05	0.07	7.2	NA
20-Dec-92	15	290	194	1690	27	<1	1.19	0.05	0.15	7.42	NA
25-Feb-93	4.3	104	180	1780	21.9	0.2	0.07	0.04	<0.01	7.26	NA
21-May-93	2.6	290	57	1690	44.6	<1	6.5	<0.05	0.83	6.7	NA
31-Aug-93	10.6	310	0.49	1800	24.7	<0.2	14	0.1	0.39	7.2	NA
7-Mar-94	12	380	170	1400	620	<0.1	320	0.21	17	7.2	NA
16-May-94	21	360	270	1800	3000	<0.03	420	0.35	25	7.1	NA
15-Jul-94	4.2	160	120	1800	50	<0.03	460	0.47	16	7.1	NA
23-Sep-94	16	300	300	1300	38	<0.03	98	0.065	3.7	7.3	NA
24-Feb-95	13	360	180	690	30	0.06	130	0.1	6.3	7.3	NA
5-May-95	19	290	170	1700	52	<0.03	190	0.14	1.1	7	NA
10-Jul-95	19	400	170	2000	110	<0.1	130	0.12	6.4	7.1	NA
5-Oct-95	21	350	260	1800	78	<0.03	120	0.092	6.5	7.3	NA
1-May-96	18	130	79	1900	12	0.09	42	0.024	1.2	7	NA
24-Jun-96	19	<1.1	0.96	2900	20	0.042	35	0.065	1.1	6.9	NA
17-Sep-96	36	NA	NA	NA	NA	<.03	NA	NA	NA	NA	NA
19-Nov-96	11	55	NA	NA	NA	0.09	2.5	0.005	0.61	7.8	NA
Ave	11.6	250.4	235.0	5052.9	114.8	0.4	43.4	0.10	2.0		
Max	36	1418	1760	145000	3000	5.25	460	0.47	25		
Class I GQS (mg/L)	NS	200	400	1200	NS	0.1	5	0.0075	0.15	6.5-9.0	
Class II GQS (mg/L)	NS	200	400	1200	NS	0.1	5	0.1	10	6.5-9.0	

Concentrations in mg/L

Bold and Shaded = Exceeds Class I Groundwater Quality Standard (GQS)

Class I and Class II Groundwater Quality Standards (Title 35, Part 620, Subpart D)

NA=Not Available

NS=No Standard established by IEPA

Quarterly Groundwater Monitoring Data (1983-1996)
SUPPLY SIDE LANDFILL

G103

Sampling Date	Ammonia	Chloride	Sulfate	TDS	TOC	Phenolics	Iron	Lead	Manganese	pH	Depth to Water	Comments
22-Nov-83	12.6	53	366	NA	85	0.014	18.8	<0.10	0.91	NA	NA	
1-Mar-84	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
27-Feb-85	503.6	289	503.6	71.43	23	0.07143	<0.1	<0.1	<0.1	6.1	3	
27-Aug-85	0.08	493	806	3435	206	0.025	0.1	0.14	0.62	7	5	
19-Nov-85	0.52	122	473	1345	25	0.335	<0.1	<0.1	0.49	6.9	4.5	
24-Feb-86	14.7	222	543	1944	75	0.001	2.2	<.01	3.2	7.3	6.67	
7-Jul-86	0.88	130	314	1070	13	0.029	0.04	0.02	0.24	7	NA	
26-Aug-86	1935	215	170	1970	128	<0.001	8.5	<0.05	<0.1	7.1	NA	
24-Nov-86	250	495	220	2000	94	<0.01	0.9	<.2	<.2	7.6	NA	
26-Feb-87	0.3	198	180	1890	84	<0.01	<0.3	<0.3	<0.2	7.8	NA	
19-May-87	1.06	328	11	2140	92	<0.1	<0.3	<0.2	<0.2	6.9	NA	
20-Aug-87	1.92	99	25.5	1382	14.6	0.0125	<0.2	<0.2	<0.2	7.4	NA	
30-Nov-87	<0.02	301	8.9	1790	101	<0.01	<0.2	<0.2	<0.2	7.4	NA	
28-Feb-88	60	154.6	13.4	2393	70	2.3	<0.2	NA	<0.2	7	NA	
28-May-88	<0.1	202	13.2	1680	67	<0.1	4	<0.2	<0.2	7	NA	
1-Sep-88	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Dry Well
30-Nov-88	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
28-Feb-89	1	55	33.3	1280	15.8	0.0057	0.81	0.29	0.94	7.4	NA	
31-May-89	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Dry Well
31-Aug-89	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
30-Nov-89	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
28-Feb-90	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Dry Well
29-May-90	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Dry Well
28-Aug-90	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
30-Nov-90	2.8	100	344	1590	390	<1	0.1	0.071	0.64	7.6	NA	
26-Feb-91	5.8	36	47	540	11.4	<1	0.2	0.05	0.41	7.4	NA	
31-May-91	<1	49.6	322	720	19.5	<1	0.05	0.03	1.06	6.8	NA	
30-Aug-91	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
26-Nov-91	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
28-Feb-92	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
28-May-92	80.6	228	430	69000	64.7	<1	1.6	0.06	0.58	6.6	NA	
31-Aug-92	4.8	98.4	150	2170	27.7	<1	0.71	0.04	0.59	7.6	NA	
30-Dec-92	1	85	225	680	11	<1	3.8	0.04	0.77	7.28	NA	
25-Feb-93	4.9	48.4	210	1270	19.9	1.2	2.68	0.03	16.5	7.25	NA	
21-May-93	0.7	61	245	1190	44.5	<1	130	0.5	5.44	7.3	NA	
31-Aug-93	17.7	150	70	860	17.4	<0.2	90	0.15	0.68	7.2	NA	
7-Mar-94	22	88	280	810	22	<0.1	37	0.079	1.4	7	NA	
16-May-94	28	52	68	710	43	<0.03	30	0.041	0.99	7.1	NA	
15-Jul-94	11	26	250	940	27	<0.03	39	0.0036	1.5	6.7	NA	
23-Sep-94	19	29	220	630	50	<0.03	100	0.11	1.5	6.8	NA	
24-Feb-95	20	120	320	980	52	<0.03	22	0.033	0.61	7.2	NA	
5-May-95	30	70	110	1000	32	<0.03	20	0.028	0.69	7.1	NA	
10-Jul-95	29	43	42	510	36	<0.1	36	0.043	1.1	7	NA	
5-Oct-95	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Silted Well
1-May-96	22	110	100	520	21	0.031	87	0.051	1.3	6.8	NA	
24-Jun-96	16	2	180	7500	29	0.039	41	0.017	1.7	7	NA	
17-Sep-96	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Obstructed well
19-Nov-96	7.5	350	160	1400	160	<0.03	25	<.005	1.1	7.7	NA	
Ave	91.3	150.1	219.2	3557.9	63.9	0.2	20.7	0.08	1.3			
Max	1935	495	806	69000	390	2.3	130	0.5	16.5			
Class I GQS (mg/L)	NS	200	400	1200	NS	0.1	5	0.0075	0.15	6.5-9.0		
Class II GQS (mg/L)	NS	200	400	1200	NS	0.1	5	0.1	10	6.5-9.0		

Concentrations in mg/L

Bold and Shaded = Exceeds Class I Groundwater Quality Standard (GQS)

Class I and Class II Groundwater Quality Standards (Title 35, Part 620, Subpart D)

NA=Not Available

NS=No Standard established by IEPA

Quarterly Groundwater Monitoring Data (1983-1996)
SUPPLY SIDE LANDFILL

G104

Sampling Date	Ammonia	Chloride	Sulfate	TDS	TOC	Phenolics	Iron	Lead	Manganese	pH	Depth to Water
22-Nov-83	0.28	40	**489**	NA	33	<0.01	2.3	<0.10	**0.87**	NA	NA
1-Mar-84	0.23	43	**472**	NA	51	<0.01	0.1	**0.03**	**0.38**	NA	NA
27-Feb-85	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
27-Aug-85	0.08	130	**518.6**	**1984**	24	**0.138**	<0.1	**0.1**	**1.6**	7	4
19-Nov-85	0.5	109	**670**	**1640**	43	**0.123**	<0.1	<0.1	**1.1**	7	2
24-Feb-86	0.53	88	**650**	**1624**	17	0.001	2.6	<.01	**6.4**	7.6	4.5
7-Jul-86	0.94	110	**414**	**1650**	15	<0.019	0.01	**0.03**	0.09	7	6
26-Aug-86	3.2	108	**430**	**1985**	8	<0.001	<0.1	<0.05	<0.1	7.2	NA
24-Nov-86	1.5	**284**	**620**	**1620**	<5	<0.01	<.2	<.2	**0.8**	7.6	NA
26-Feb-87	<0.1	89	**620**	**1650**	12	0.05	<0.3	<0.3	<0.2	7.7	NA
19-May-87	0.06	115	29.5	**1630**	9	<0.01	<0.3	<0.2	<0.2	7.4	NA
20-Aug-87	56.4	163	12.5	**1284**	45.3	0.01	<0.2	<0.2	<0.2	7.6	NA
30-Nov-87	0.07	**234**	11	**1500**	10	<0.01	<0.2	<0.2	<0.2	7.3	NA
28-Feb-88	<5	**297.6**	15	**1546**	9	<0.5	<0.2	NA	<0.2	7.1	NA
28-May-88	<0.1	140	15	**1600**	20	<0.1	3.2	<0.2	<0.2	7.1	NA
1-Sep-88	0.42	NA	34.12	1170	11.6	<0.1	<0.2	<0.5	<0.2	7	NA
30-Nov-88	0.5	**575**	17	1144	14.7	<0.5	<0.2	<0.2	<0.2	7.1	NA
28-Feb-89	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
31-May-89	2.4	**326**	312	960	36.22	<1	<0.05	**0.1**	<0.05	7.7	NA
31-Aug-89	3.6	43	110	1140	9.2	<1	0.12	**0.01**	<0.02	7.5	NA
30-Nov-89	3	39	215	**1300**	28.3	<1	0.43	**0.02**	**1.05**	7.4	NA
28-Feb-90	6.3	188	224	**1270**	6.7	<1	0.05	**0.24**	0.03	7.6	NA
29-May-90	1.4	35.4	200	1100	12.3	<1	0.07	**0.06**	0.01	6.9	NA
28-Aug-90	2.5	130	<1	340	19.2	<1	0.01	**0.05**	<0.01	7.1	NA
30-Nov-90	3	43	29	1000	66	<1	0.09	**0.076**	0.023	7.4	NA
26-Feb-91	2.47	43	353	1000	7	<1	0.3	**0.04**	**0.34**	7.6	NA
31-May-91	2.2	28.4	222	570	12.1	<1	0.13	**0.05**	**0.59**	7.5	NA
30-Aug-91	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
26-Nov-91	0.3	191	180	710	73.7	<1	0.1	**0.12**	0.01	7.98	NA
28-Feb-92	0.93	40	150	1150	12.6	<1	0.01	**0.05**	0.02	7.5	NA
28-May-92	<0.5	43	100	**88000**	6.18	<1	0.05	**0.03**	<0.1	7.09	NA
31-Aug-92	1	42.6	130	1020	7.66	<1	0.08	**0.06**	**0.85**	7.3	NA
30-Dec-92	0.2	53	170	790	8.4	<1	**6.28**	**0.02**	**1.17**	7.38	NA
25-Feb-93	0.72	40.9	200	1030	7.9	<1	0.03	**0.03**	0.02	7.2	NA
21-May-93	0.7	35	230	1190	7.2	<1	**10.6**	<0.05	**1.36**	6.8	NA
31-Aug-93	0.98	41.7	73.6	840	9.44	<0.2	**6.32**	<0.050	**1.32**	7.3	NA
7-Mar-94	NA	50	220	**3400**	11	<0.1	**16**	**0.015**	**1.4**	7.2	NA
16-May-94	2.2	36	99	1100	28	<0.03	**67**	**0.052**	**4.3**	7.8	NA
15-Jul-94	0.27	35	89	1100	68	<0.03	**92**	**0.099**	**5.1**	7.1	NA
23-Sep-94	1	30	200	850	17	<0.03	**300**	**0.19**	**8.2**	7	NA
24-Feb-95	1	38	130	900	13	<0.03	**110**	**0.092**	**4.3**	7.2	NA
5-May-95	2.1	40	150	1100	NA	0.00049	**380**	**0.27**	**1.5**	7	NA
10-Jul-95	1.3	38	110	1100	150	<0.1	**30**	**0.025**	**2**	7	NA
5-Oct-95	1.1	42	**660**	960	85	<0.03	**61**	**0.064**	**3.5**	7.1	NA
1-May-96	2.3	170	52	880	6	<.03	**33**	**0.017**	**2.6**	6.9	NA
24-Jun-96	2.2	<1.1	78	**1400**	8	0.069	**29**	**0.097**	**2.4**	6.9	NA
17-Sep-96	1.7	47	110	1100	30	0.034	**35**	**0.0343**	**3.5**	7	NA
19-Nov-96	0.53	38	36	1000	160	<0.03	**11**	<0.005	**2.2**	7.1	NA
Ave	2.6	101.2	218.9	3263.4	28.0	0.2	26.6	0.07	1.3		
Max	56.4	575	670	88000	160	0.5	380	0.27	8.2		
Class I GQS (mg/L)	NS	200	400	1200	NS	0.1	5	0.0075	0.15	6.5-9.0	
Class II GQS (mg/L)	NS	200	400	1200	NS	0.1	5	0.1	10	6.5-9.0	

Concentrations in mg/L

Bold and Shaded = Exceeds Class I Groundwater Quality Standard (GQS)

Class I and Class II Groundwater Quality Standards (Title 35, Part 620, Subpart D)

NA=Not Available

NS=No Standard established by IEPA

Off Site Gas Monitoring Wells (1995-1996)
SUPPLY SIDE LANDFILL

MW 5

Sampling Date	Ammonia	Chloride	Sulfate	TDS	TOC	Phenolics	Iron	Lead	Manganese	pH
24-Feb-95	0.12	150	56	880	6.4	ND	**11**	**0.015**	**1.1**	7.3
5-May-95	0.24	80	30	420	ND	**0.42**	3.5	**0.019**	**0.67**	7.2
10-Jul-95	0.2	80	32	530	12	ND	2.9	0.0059	**0.3**	7.1
5-Oct-95	ND	75	53	600	8	ND	4.5	0.0061	**0.37**	7.4
1-May-96	0.17	39	87	640	1.2	<.03	2.2	<.05	**0.32**	7.3
24-Jun-96	<.10	<1.1	56	86	<1	<.03	0.98	<.005	**0.18**	7.2
17-Sep-96	0.37	98	110	880	11	<.03	**20**	**0.018**	**0.59**	7
19-Nov-96	<.1	160	78	820	4.6	<.03	1.1	<.005	**0.25**	7.2
Class I GQS (mg/L)	NS	200	400	1200	NS	0.1	5	0.0075	0.15	6.5-9.0
Class II GQS (mg/L)	NS	200	400	1200	NS	0.1	5	0.1	10	6.5-9.0

MW 6

Sampling Date	Ammonia	Chloride	Sulfate	TDS	TOC	Phenolics	Iron	Lead	Manganese	pH
24-Feb-95	0.33	49	110	150	41	0.06	**7.9**	**0.0062**	**0.3**	7.6
5-May-95	0.42	80	110	610	ND	ND	**5.9**	0.006	**0.27**	7.3
10-Jul-95	0.48	190	290	**1300**	12	ND	**7.6**	ND	**0.4**	7.1
5-Oct-95	0.54	180	**930**	480	5.9	ND	**9.6**	ND	**0.53**	7.1
1-May-96	0.42	65	86	540	2	<.03	3.3	<.05	**0.29**	7.1
24-Jun-96	0.23	5	130	1000	2.3	<.03	0.76	<.005	**0.2**	7.1
17-Sep-96	0.69	170	**500**	**1300**	4.2	<.03	**15**	**0.0077**	**0.64**	7.1
19-Nov-96	0.12	150	340	1200	3.3	<.03	**8.9**	<.005	**0.75**	7.3
Class I GQS (mg/L)	NS	200	400	1200	NS	0.1	5	0.0075	0.15	6.5-9.0
Class II GQS (mg/L)	NS	200	400	1200	NS	0.1	5	0.1	10	6.5-9.0

MW 7

Sampling Date	Ammonia	Chloride	Sulfate	TDS	TOC	Phenolics	Iron	Lead	Manganese	pH
24-Feb-95	0.11	15	39	230	ND	ND	0.88	**0.016**	**0.16**	7.8
5-May-95	0.22	150	70	550	ND	ND	2.4	ND	**0.39**	7.4
10-Jul-95	0.12	**400**	96	**1400**	4	ND	2.2	ND	**0.5**	7.3
5-Oct-95	0.11	**320**	100	970	7.7	ND	2	ND	**0.47**	7.2
1-May-96	0.15	69	64	620	3.4	<.03	**5.4**	**8.3**	**0.21**	7.2
24-Jun-96	0.16	7	47	700	2.9	0.039	**38**	<.005	**0.32**	7.1
17-Sep-96	0.56	**370**	110	**1400**	4.6	<.03	4.5	<.005	**0.59**	7.3
19-Nov-96	<.1	**310**	55	950	1.8	<.03	2.1	<.005	**0.53**	7.5
Class I GQS (mg/L)	NS	200	400	1200	NS	0.1	5	0.0075	0.15	6.5-9.0
Class II GQS (mg/L)	NS	200	400	1200	NS	0.1	5	0.1	10	6.5-9.0

Concentrations in mg/L

Bold and Shaded = Exceeds Class I Groundwater Quality Standard (GQS)

Class I and Class II Groundwater Quality Standards (Title 35, Part 620, Subpart D)

NA=Not Available

NS=No Standard established by IEPA

APPENDIX F

GROUNDWATER MONITORING DATA (1999-2002)

Quarterly Groundwater Monitoring Data (1999-2002)
SUPPLY SIDE LANDFILL

MW-A (G102)

Sampling Date	Ammonia	Chloride	Sulfate	TDS	TOC	Phenolics	Iron	Lead	Manganese	pH	Depth to Water
Jul-99	12.8	55.2	50.8	683	22.8	<0.10	**10.6**	<0.001	**0.53**	6.9	-
Oct-99	7.5	46.1	102	679	25.7	<0.10	4.25	<0.001	**0.478**	6.85	-
Jan-00	8.86	47.9	112	414	13.5	**0.27**	1.01	0.003	**0.517**	6.91	-
Apr-00	110	10	190	700	19	0.036	0.12	0.003	**0.24**	7.02	-
Jul-00	0.4	4.94	50.5	717	34	<0.005	**10.7**	<0.005	**0.642**	7	-
Oct-00	6	44.3	2.84	706	11	<0.005	**9.98**	<0.004	0.147	7.06	-
Jan-01	13.9	61.2	12.6	778	12	<0.005	**16.8**	<0.005	**0.883**	7.01	8.1
Apr-01	0.0336	53.2	135	823	15	<0.005	2.66	<0.004	**1.02**	7	9
Jul-01	20.4	50.4	66.2	795	20	<0.1	**17.6**	<0.003	**0.61**	6.6	-
Oct-01	14	12.1	106	509	16	<0.1	**9.32**	<0.171	**0.53**	6.76	-
Jan-02	20.3	47.2	71	773	9	<0.005	**20.3**	<0.171	**0.518**	6.58	-
Apr-02	31	35	92	780	14	<0.005	**13**	<0.001	**0.52**	6.8	-
Jul-02	9.9	-	57	770	13	0.005	**11**	<0.002	**0.46**	6.82	9.96
Oct-02	17	63	110	740	13	0.005	**25**	<0.002	**0.51**	7.01	-
Ave	19.4	40.8	82.7	704.8	17.0	0.04	10.9	0.014	0.54		
Max	110	63	190	823	34	0.27	25	<0.171	1.02		
Class I GQS (mg/L)	NS	200	400	1200	NS	0.1	5	0.0075	0.15	6.5-9.0	
Class II GQS (mg/L)	NS	200	400	1200	NS	0.1	5	0.1	10	6.5-9.0	

MW-B (G103)

Sampling Date	Ammonia	Chloride	Sulfate	TDS	TOC	Phenolics	Iron	Lead	Manganese	pH	Depth to Water
Jul-99	5.5	**254**	122	<10.0	24.4	<0.10	**5.85**	<0.001	**0.252**	7.02	-
Oct-99	6.38	**331**	161	**1340**	38.8	<0.10	2.16	0.002	**0.221**	6.93	-
Jan-00	4.95	**425**	147	**1470**	25.8	<0.10	**5.08**	<0.001	**0.163**	6.93	-
Apr-00	76	**300**	190	**1500**	35	0.054	**8**	<0.003	**0.32**	6.96	-
Jul-00	0.96	7.61	378	1099	36	<0.005	**8.36**	<0.005	**0.193**	7.5	-
Oct-00	10.8	152	8.82	**1800**	19	**38.1**	**5.21**	<0.004	<0.0001	7.14	-
Jan-01	5.6	**292**	9.98	**1630**	28	0.0127	**10.6**	<0.005	0.117	6.97	8.1
Apr-01	<0.0277	**390**	132	332	23	0.00794	**6.87**	<0.004	0.104	7	8.6
Jul-01	8.7	**360**	127	**1560**	21	<0.1	**9.24**	<0.003	0.145	6.64	-
Oct-01	5.6	**300**	104	**1360**	32	<0.1	**8.86**	<0.171	0.128	7.07	-
Jan-02	97	**382**	113	**1500**	20	0.01	**9.44**	<0.171	0.133	6.62	-
Apr-02	2	200	160	**1500**	23	<0.005	**7.4**	**0.097**	0.0028	6.7	-
Jul-02	8.7	-	150	**1700**	21	0.005	3.9	<0.002	0.11	6.87	-
Oct-02	3.9	**410**	150	**1500**	22	0.093	**8**	<0.002	0.13	6.91	-
Ave	16.9	292.6	139.5	1306.9	26.4	2.8	7.2	0.020	0.14		
Max	97	425	378	1800	38.8	38.1	10.6	0.097	0.32		
Class I GQS (mg/L)	NS	200	400	1200	NS	0.1	5	0.0075	0.15	6.5-9.0	
Class II GQS (mg/L)	NS	200	400	1200	NS	0.1	5	0.1	10	6.5-9.0	

MW-C

Sampling Date	Ammonia	Chloride	Sulfate	TDS	TOC	Phenolics	Iron	Lead	Manganese	pH	Depth to Water
Jul-99	0.14	138	342	1150	5.5	<0.10	0.676	<0.001	**0.19**	7.28	-
Oct-99	0.34	137	279	**1650**	11.7	<0.10	<0.100	<0.001	**0.17**	7.2	-
Jan-00	<0.10	175	291	1040	5.5	<0.10	<0.100	<0.003	0.05	7.26	-
Apr-00	48	150	380	1100	5.6	0.078	0.21	<0.003	<0.10	7.19	-
Jul-00	0.8	13.1	160	**1307**	<9	<0.005	<0.0044	<0.005	<0.0001	7.5	-
Oct-00	<0.0277	140	15.2	1070	<6	<0.005	<0.0044	<0.004	<0.0001	7.32	-
Jan-01	<0.0277	151	15.2	1070	<9	<0.005	0.07	<0.005	<0.0001	7.24	4
Apr-01	<0.0277	160	203	1100	<6	<0.005	<0.0044	<0.004	<0.15	6.5	3.05
Jul-01	<0.4	137	318	1100	<6	<0.1	<0.075	<0.003	<0.042	6.91	-
Oct-01	<0.4	123	340	1160	<6	<0.1	<0.116	<0.171	<0.042	7.48	-
Jan-02	<0.4	124	331	1130	<6	<0.005	<0.116	<0.171	<0.042	6.96	-
Apr-02	0.94	140	300	1000	2.3	<0.005	<0.1	**0.001**	0.035	6.9	-
Jul-02	0.08	-	300	1100	3	0.005	0.25	<0.002	0.07	7.06	7.17
Oct-02	0.24	110	210	1100	2.6	0.005	0.05	<0.002	0.017	6.98	-
Ave	3.7	130.6	248.9	1148.4	4.3	0.03	0.11	0.013	0.05		
Max	48	175	380	1650	11.7	0.078	0.676	<0.171	0.19		
Class I GQS (mg/L)	NS	200	400	1200	NS	0.1	5	0.0075	0.15	6.5-9.0	
Class II GQS (mg/L)	NS	200	400	1200	NS	0.1	5	0.1	10	6.5-9.0	

Concentrations in mg/L.
Bold and Shaded = Exceeds Class I Groundwater Quality Standard (GQS)
Class I and Class II Groundwater Quality Standards (Title 35, Part 620, Subpart D)
NA=Not Available
NS=No Standard established by IEPA

Quarterly Groundwater Monitoring Data (1999-2002)
SUPPLY SIDE LANDFILL

MW-D

Sampling Date	Ammonia	Chloride	Sulfate	TDS	TOC	Phenolics	Iron	Lead	Manganese	pH	Depth to Water
Jul-99	0.16	42.1	59.9	589	23.6	<0.10	<0.100	<0.001	0.214	7.4	-
Oct-99	0.24	49.6	217	811	25.4	0.17	0.113	<0.001	0.119	7.17	-
Jan-00	<0.10	38.1	286	1130	9.5	0.2	0.399	<0.002	0.387	7.2	-
Apr-00	44	90	310	940	3.7	<0.005	1.1	<0.003	0.77	7.15	-
Jul-00	0.3	13.1	125	1110	6	<0.005	0.58	<0.005	0.662	7.5	-
Oct-00	<0.0277	74.5	11.3	1019	<6	<0.005	0.592	<0.004	0.234	7.26	-
Jan-01	<0.0277	50.5	8.09	3000	<9	<0.005	1.21	<0.005	0.327	7.3	6.6
Apr-01	<0.0277	31.9	58.1	429	<6	0.0381	1.78	<0.004	0.388	7	6.9
Jul-01	0.8	61	92.8	602	<6	<0.1	0.61	<0.003	1.04	7.03	-
Oct-01	<0.4	14.8	19.8	399	<6	<0.1	0.259	<0.171	0.054	7.22	-
Jan-02	<0.4	39.2	52.6	515	<6	<0.005	1.36	<0.171	0.486	7.04	-
Apr-02	0.92	30	110	490	1.7	0.002	0.26	<0.001	0.25	7	-
Jul-02	0.05	-	-	-	-	-	0.05	<0.002	0.13	-	11.03
Oct-02	0.26	48	140	770	2	0.005	0.048	<0.002	0.39	7.01	-
Ave	3.4	44.8	114.7	908.0	7.0	0.044	0.6	0.013	0.4		
Max	44	90	310	3000	25.4	0.2	1.78	<0.171	1.04		
Class I GQS (mg/L)	NS	200	400	1200	NS	0.1	5	0.0075	0.15	6.5-9.0	
Class II GQS (mg/L)	NS	200	400	1200	NS	0.1	5	0.1	10	6.5-9.0	

MW-E

Sampling Date	Ammonia	Chloride	Sulfate	TDS	TOC	Phenolics	Iron	Lead	Manganese	pH	Depth to Water
Jul-99	0.14	20.4	45.9	530	5.5	<0.10	0.478	<0.001	0.328	7.38	-
Oct-99	0.24	40.8	61.3	<10.0	24	0.31	0.909	<0.001	0.332	7.27	-
Jan-00	<0.10	136	65.2	652	5.8	0.32	0.788	<0.001	<0.001	7.34	-
Apr-00	53	35	130	450	4	0.042	0.71	<0.003	0.17	7.26	-
Jul-00	0.4	2.63	19.5	240	13	<0.005	3.67	<0.005	1.66	7.5	-
Oct-00	<0.0277	23	4.73	518	<6	<0.005	0.619	<0.004	<0.0001	7.41	-
Jan-01	<0.0277	37.2	5.78	529	<3	<0.005	0.878	<0.005	0.169	7.31	6.5
Apr-01	<0.0277	31	81.7	488	<6	0.0984	1.09	<0.004	0.27	7	7.15
Jul-01	0.6	26.6	54.5	489	<3	<0.1	0.841	<0.003	0.194	7	-
Oct-01	0.6	14.4	45.6	352	7	7.27	<0.116	<0.171	<0.042	7.27	-
Jan-02	<0.4	23.8	50.3	469	<6	<0.005	1.54	<0.171	0.166	6.98	-
Apr-02	1.5	30	290	470	-	<0.171	0.56	<0.001	0.18	7	-
Jul-02	0.17	-	72	750	2.4	0.005	0.84	<0.002	0.25	7.11	7.79
Oct-02	1.2	31	120	550	2	0.0035	0.88	<0.002	0.22	7.04	-
Ave	4.2	34.8	74.8	463.7	5.8	0.6	1.0	0.013	0.3		
Max	53	136	290	750	24	7.27	3.67	<0.171	1.66		
Class I GQS (mg/L)	NS	200	400	1200	NS	0.1	5	0.0075	0.15	6.5-9.0	
Class II GQS (mg/L)	NS	200	400	1200	NS	0.1	5	0.1	10	6.5-9.0	

MW-F (G104)

Sampling Date	Ammonia	Chloride	Sulfate	TDS	TOC	Phenolics	Iron	Lead	Manganese	pH	Depth to Water
Jul-99	1.93	18.7	129	750	22.6	<0.10	1.58	<0.001	1.5	7.13	-
Oct-99	3.13	21.3	470	1170	38.4	<0.10	2.68	<0.001	1.47	7.02	-
Jan-00	2.13	32.8	688	1540	21.2	0.29	0.271	<0.001	0.894	7.42	-
Apr-00	77	10	290	1100	11	0.078	0.11	<0.003	<0.10	7.13	-
Jul-00	2.8	9.98	12.4	854	17	<0.005	0.663	<0.005	0.21	7.5	-
Oct-00	<0.0277	24.8	15.2	1063	<6	86.4	0.685	<0.004	0.372	7.21	-
Jan-01	<0.0277	17.7	9.98	85	<3	<0.005	0.027	<0.005	<0.0001	7.28	8.8
Apr-01	<0.0277	15.1	162	675	<6	0.171	0.101	<0.004	0.077	7	7.2
Jul-01	2	60.2	142	735	10	<0.1	0.153	<0.003	0.722	6.78	-
Oct-01	0.4	20.8	130	465	8	<0.1	<0.116	<0.171	<0.042	7.44	-
Jan-02	1.8	34.7	249	880	<6	<0.005	2.15	<0.171	0.683	6.88	-
Apr-02	1.9	36	310	860	5.9	0.011	0.2	<0.001	0.37	6.9	-
Jul-02	1.6	-	250	840	7	0.005	1	<0.002	1	7.01	11.55
Oct-02	1.8	19	210	820	7.9	0.005	4.2	<0.002	1.2	6.98	-
Ave	6.9	24.7	219.1	845.5	11.4	6.2	1.0	0.013	0.6		
Max	77	60.2	688	1540	38.4	86.4	4.2	<0.171	1.5		
Class I GQS (mg/L)	NS	200	400	1200	NS	0.1	5	0.0075	0.15	6.5-9.0	
Class II GQS (mg/L)	NS	200	400	1200	NS	0.1	5	0.1	10	6.5-9.0	

Concentrations in mg/L.
Bold and Shaded = Exceeds Class I Groundwater Quality Standard (GQS)
Class I and Class II Groundwater Quality Standards (Title 35, Part 620, Subpart D)
NA=Not Available
NS=No Standard established by IEPA

APPENDIX G

GEOTECHNICAL EVALUATION OF BORROW SOURCE

MEMORANDUM

DATE: February 28, 2003

TO: Blayne Kirsch, P.E., P.G.

FROM: Gary Goodheart, P.E.

SUBJECT: Geotechnical Evaluation of Proposed Cover Materials
Supply Side Landfill
Versar Project No. 110684.0006.001

This memorandum summarizes Versar's geotechnical evaluation of proposed borrow material available from the Veteran's Administration (VA) site for use as cover material for Supply Side Landfill at Naval Training Center Great Lakes (NTC). This evaluation has been conducted n accordance with Versar Proposal No. Q03-5188, dated January 24, 2003, and authorized by NTC Contract Modification No. P00004, dated February 5, 2003.

BACKGROUND INFORMATION

Versar has been engaged by NTC to perform a Final Cover Study for the Supply Side Landfill at NTC. As a result of the project meeting on December 23, 2002, we understand there may be up to 55,000 cubic yards of silty clay material and top soil available at NTC for use as final cover or for general grading for Supply Side and Forrestal Landfills.

NTC provided Versar technical specifications for the construction of Multiple Recruit Barracks and Infrastructure at the former VA golf course (Site). Versar reviewed the Foundation Engineering Report (prepared by others) which characterizes subsurface conditions at the Site. The geotechnical borings taken across the Site identify the presence of a glacial till (below the topsoil/fill layer) that ranges approximately 9 to 23 feet below existing ground surface. The glacial till material is described as brown to gray very fine sandy clayey silt or silty clay with traces of coarse sand and small gravel.

FIELD OBSERVATIONS AND SAMPLING

Versar conducted a Site visit on February 6, 2003 to observe field conditions and to identify sampling locations prior to conducting field sampling at potential borrow locations at the recruit barracks construction site. Part of the top soil had been stripped off and stockpiled on site. The

majority of current excavation activity consists of underground utility construction. Limited excavation has also occurred at the Site, including construction of a retention pond and some of the building pads. Versar observed that gray clay (presumably excavated from the retention pond) was used as fill under the proposed building slabs. No large stockpiles of clay soils were observed at the Site.

A second proposed borrow source consists of a half-mile long water line trench located north of Buckley Road. The water line trench "zig-zags" around several existing facilities and crosses under several paved parking areas; subsurface conditions likely vary along the utiltiy alignment. No excavation activities were occurring at the time of Versar's site visit.

On February 7, Versar conducted field sampling at the primary borrow site at four locations as indicated on attached Figure 1. Field observations are documented on photos included as Appendix A. Samples were collected from existing stock piles (Locations 1 and 2), and test pits excavated to approximately 10 feet deep (Locations 3 and 4). The test pits revealed silty clay to clay soils, consistent with the previous soil boring logs. In general, a layer of brown clay is underlain by gray clay to the maximum depth investigated. Samples of brown clay were collected from Location 1 and Location 4, gray clay from Location 2, and a mixed brown and gray clay from Location 3. The soil samples were submitted to Great Lakes Soil & Environmental Consultants, Inc. for geotechnical testing.

GEOTECHNICAL TEST RESULTS

The laboratory testing program consisted of Atterberg limits, grain size analysis, standard Proctor, and hydraulic conductivity. The tests were performed on bulk disturbed samples. Soils were re-molded to 95 percent standard Proctor density for the hydraulic conductivity tests. Geotechnical testing results are summarized in Table 1. Complete geotechnical test reports are presented in Appendix B.

Soils data indicates that all three materials are similar, and contain in excess of 70 percent fines (silts and clays). The brown and gray material had a higher fraction of silt. Laborartory permeabilities (hydraulic conductivities) ranged from 1.3×10^{-8} cm/sec to 1.8×10^{-7} cm/sec.

CONCLUSIONS AND RECOMMENDATIONS

Based on Versar's visual inspection, geotechnical analysis, and review of available subsurface information, it is anticipated that all silty clay materials from the potential borrow source area (Recruit Barracks construction site) will meet the technical requirements for landfill cover material.

We understand these materials will be excavated and stock piled at a location west of the warehouses on the north side of Supply Side Landfill.

Versar recommends that periodic inspections be conducted as the excavations proceed at both the primary and secondary borrow source areas. Additional geotechnical testing should be conducted if subsequent excavations encounter materials other than as described herein to evaluate whether those materials are suitable for landfill cover. Versar recommends that proposed cover material also be tested for chemical analysis prior to its use.

TABLE 1
Geotechnical Test Results
Recruit Barracks Construction Site

			% Fines							
Sample	Description	% Sands & Gravels	% Silt	% Clay	LL	PL	PI	Max. Dry Density (pcf)	Optimum Moisture (%)	Permeability (cm/sec)
Loc-1	Brown clay	14.6	32.7	52.7	35	16	19	102.3	19.9	9.00E-08
Loc-2	Gray sandy clay	30.7	26.7	42.6	26	13	13	117.3	16	1.80E-07
Loc-3	Brown & gray clay w/ sand	24.4	36.9	38.7	25	14	11	114.5	16.7	1.30E-08
Loc-4	Brown clay w/ sand	29.5	22.9	47.6	38	18	20	101	21.7	

APPENDIX A

Appendix A. Pictures Taken at the Recruit Barracks Construction Site

Fig. 1 Ongoing construction at the Site

Fig. 2 Ongoing construction at the Site

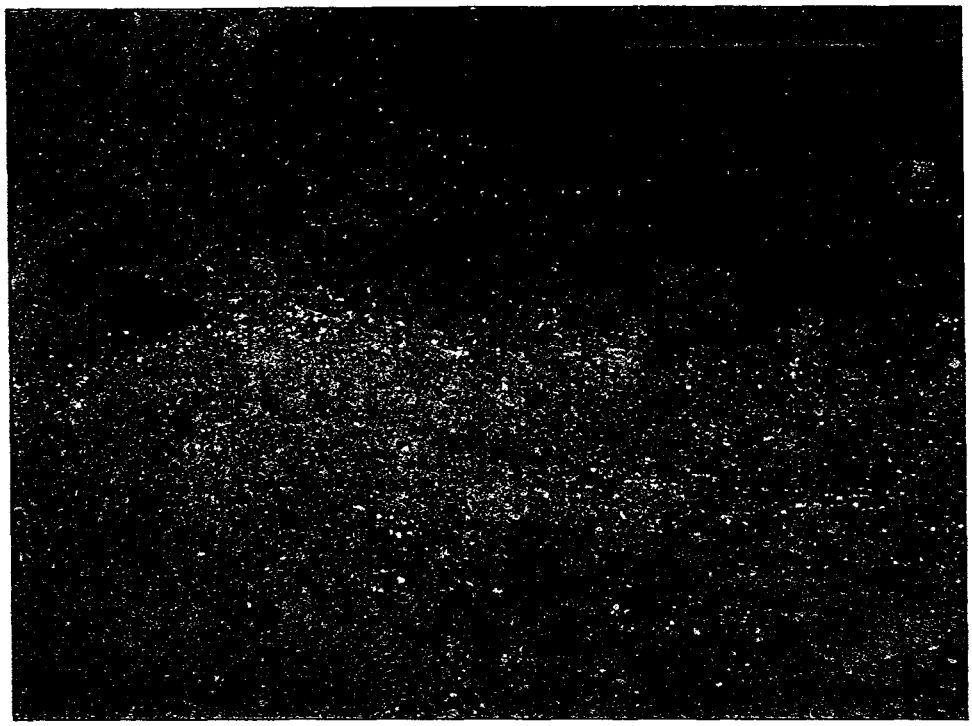


Fig. 3 Soil stockpiled at Location 1

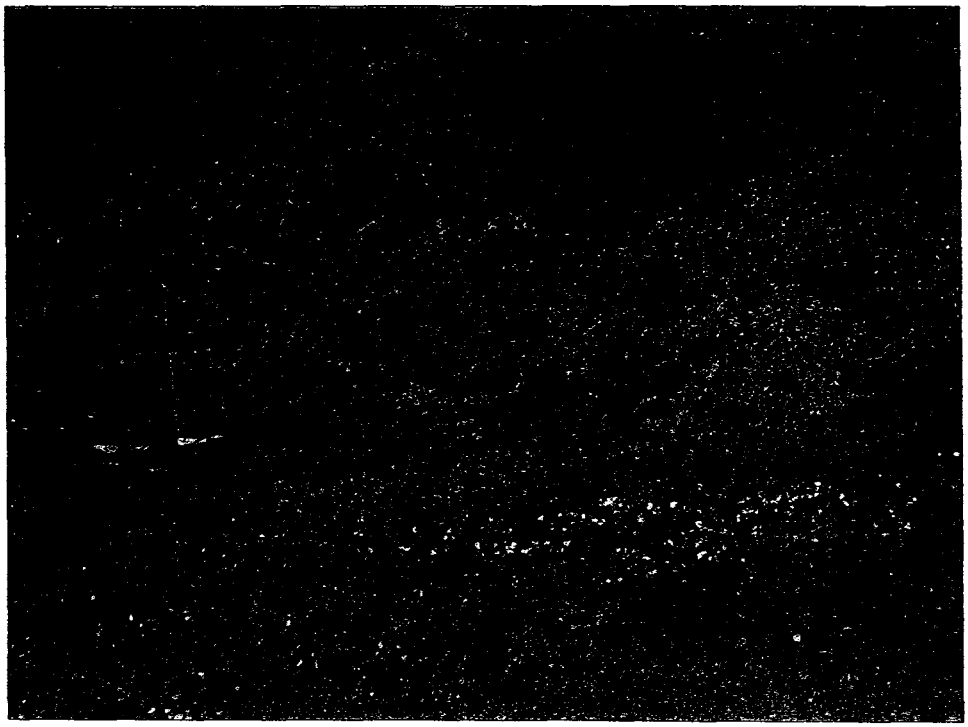


Fig. 4 Soil stockpiled at Location 2

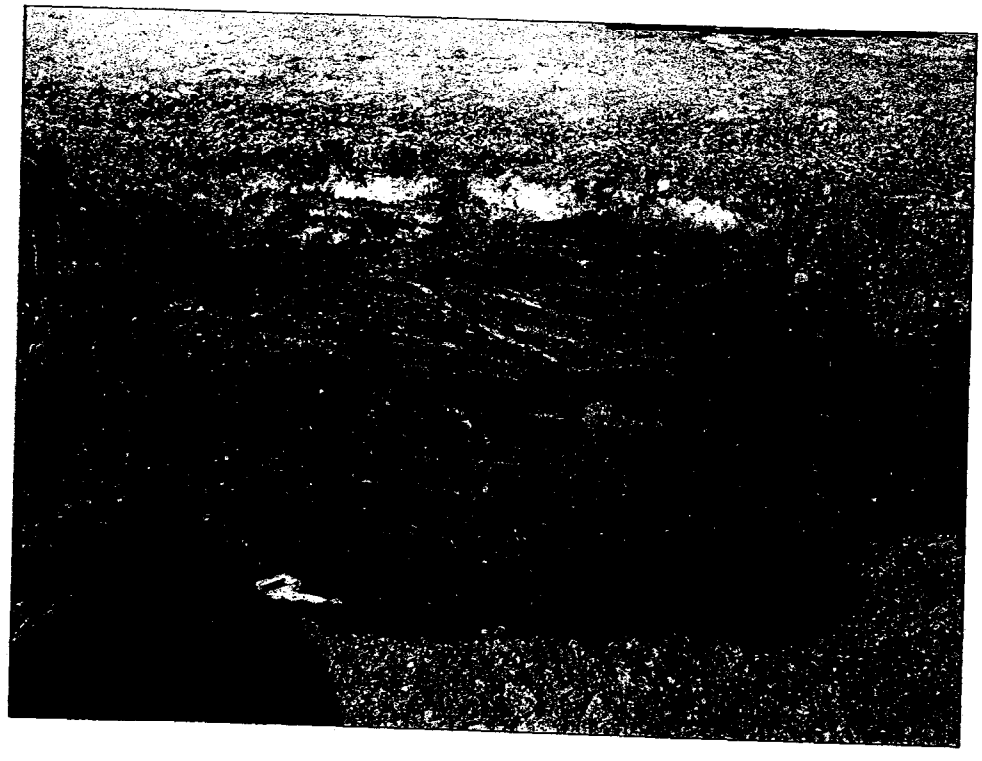


Fig. 5 Mixed soils at location 3 (test pit)

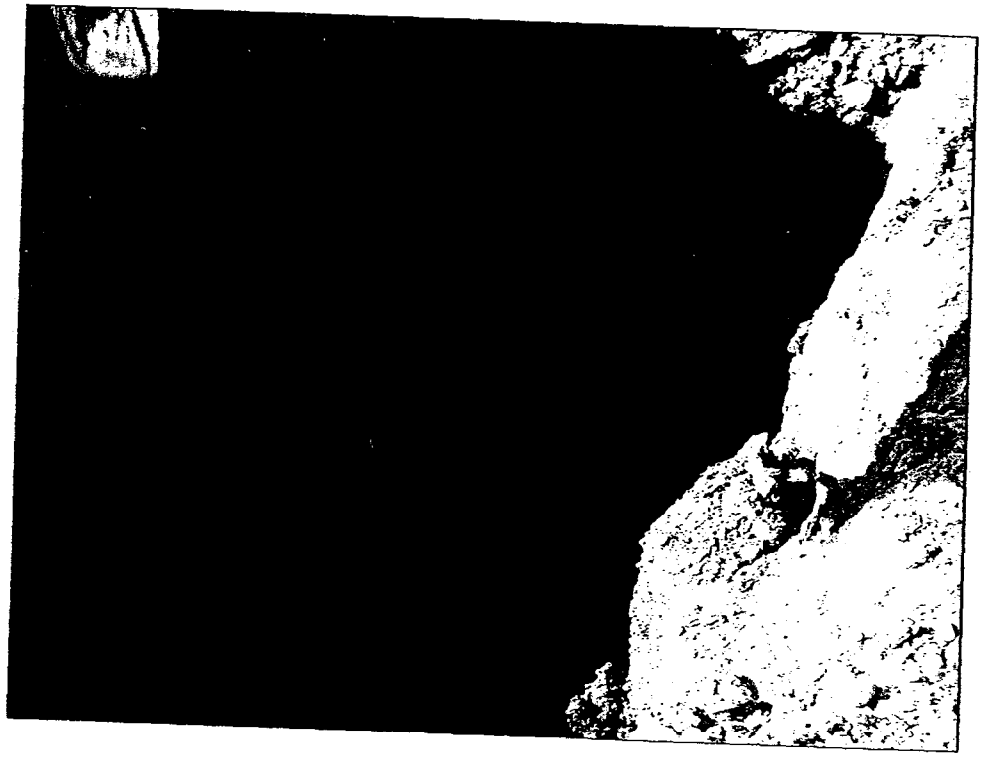


Fig. 6 Soil at Location 4 (test pit)

APPENDIX B

Great Lakes Soil & Environmental Consultants, Inc
333 Shore Drive, Burr Ridge, IL 60521 Ph: (630) 321-0944 Fax: (630) 321-0945

COEFFICIENT OF PERMEABILITY - ASTM D5084 (FLEXIBLE WALL)

Project	Supply Side Landfill						
Client	Versar, Inc. 200 West 22nd Street, Ste. 250, Lombard, IL 60148 Attn.: Mr. John Angstmann						
File #	2555	**Date Tested**		2/25/2003	**Tested by:** NP	**QC by:**	SB
Sample ID:	Loc-1	Date Recd.	2/7/03	**Location** #1			
Sample Description	Brown silty clay						

Specimen Data

Initial

Diameter:	9.90	cm	Area, A:	77.0	sq cm
Height, L:	5.14	cm	Volume, V:	395.7	cu cm
Mass of Sample:	784.8	g	**Moisture Content:**	**11.0**	**%**
			Wet Density	**123.8**	**pcf**
			Dry Density	**111.5**	**pcf**

Final

Diameter:	9.97	cm	Area, A:	78.1	sq cm
Height, L:	5.03	cm	Volume, V:	392.7	cu cm
Mass of Sample:	798.50	g	**Moisture Content:**	**17.7**	**%**
			Wet Density	**126.9**	**pcf**
			Dry Density	**107.8**	**pcf**
			Deg of Saturation	**82.2**	

Test Data

Permeant:	De-aired Tap Water
Cell Pressure	80.0 psi
Top Pressure	75.0 psi
Bottom Pressure	77.2 psi
Gradient:	30.1

Date	Time	Elapsed Time (Sec)	Cumulative Time (Sec)	Burette Readings		Outflow/Inflow Ratio	Fluid Temp. oC	Permeability cm/sec
				Outflow cc	Inflow cc			
2/25/2003	10:30 AM	0	0	3.38	5.48		20.0	---
2/25/2003	11:14 AM	2640	2640	4.00	4.80	0.9	20.0	1.04E-07
2/25/2003	11:50 AM	2160	4800	4.43	4.36	1.0	20.0	8.64E-08
2/25/2003	12:20 PM	1800	6600	4.78	3.99	0.9	20.0	9.04E-08
2/25/2003	12:40 PM	1200	7800	4.99	3.78	1.0	20.0	7.91E-08
						Average Permeability =		**9.0E-08** cm/sec

Remarks:

Great Lakes Soil & Environmental Consultants, Inc
333 Shore Drive, Burr Ridge, IL 60521 Ph: (630) 321-0944 Fax: (630) 321-0945

COEFFICIENT OF PERMEABILITY - ASTM D5084 (FLEXIBLE WALL)

Project	Supply Side Landfill						
Client	Versar, Inc. 200 West 22nd Street, Ste. 250, Lombard, IL 60148 Attn.: Mr. John Angstmann						
File #	2555	**Date Tested**	2/25/2003	**Tested by:**	NP	**QC by:**	SB
Sample ID:	Loc-2	Date Recd. 2/7/03	**Location**	#2			
Sample Description	Gray silty clay with traces of gravel						

Specimen Data

Initial

Diameter:	10.16	cm	Area, A:	81.1	sq cm
Height, L:	5.15	cm	Volume, V:	417.5	cu cm
Mass of Sample:	869.4	g	**Moisture Content:**	**11.0**	**%**
			Wet Density	**129.9**	**pcf**
			Dry Density	**117.1**	**pcf**

Final

Diameter:	10.24	cm	Area, A:	82.4	sq cm
Height, L:	5.10	cm	Volume, V:	420.0	cu cm
Mass of Sample:	880.00	g	**Moisture Content:**	**17.2**	**%**
			Wet Density	**130.7**	**pcf**
			Dry Density	**111.5**	**pcf**
			Deg of Saturation	**88.0**	

Test Data

Permeant:	De-aired Tap Water
Cell Pressure	80.0 psi
Top Pressure	75.0 psi
Bottom Pressure	77.2 psi
Gradient:	30.0

Date	Time	Elapsed Time (Sec)	Cumulative Time (Sec)	Burette Readings		Outflow/Inflow Ratio	Fluid Temp. oC	Permeability cm/sec
				Outflow cc	Inflow cc			
2/25/2003	10:31 AM	0	0	3.64	4.82		20.0	---
2/25/2003	11:14 AM	2580	2580	4.80	3.64	1.0	20.0	1.88E-07
2/25/2003	11:50 AM	2160	4740	5.68	2.79	1.0	20.0	1.78E-07
2/25/2003	12:20 PM	1800	6540	6.34	2.12	1.0	20.0	1.82E-07
2/25/2003	12:40 PM	1200	7740	6.71	1.76	1.0	20.0	1.55E-07
						Average Permeability =		**1.8E-07** cm/sec

Remarks:

Great Lakes Soil & Environmental Consultants, Inc
333 Shore Drive, Burr Ridge, IL 60521 Ph: (630) 321-0944 Fax: (630) 321-0945

COEFFICIENT OF PERMEABILITY - ASTM D5084 (FLEXIBLE WALL)

Project	Supply Side Landfill						
Client	Versar, Inc. 200 West 22nd Street, Ste. 250, Lombard, IL 60148 Attn.: Mr. John Angstmann						
File #	2555	**Date Tested**		2/25/2003	**Tested by:**	NP	**QC by:** SB
Sample ID:	Loc-3	Date Recd.	2/7/03	**Location**	#3		
Sample Description	Brown & Gray silty clay						

Specimen Data

Initial

Diameter:	10.16	cm	Area, A:	81.1	sq cm
Height, L:	5.24	cm	Volume, V:	424.8	cu cm
Mass of Sample:	854.5	g	**Moisture Content:**	**11.0**	**%**
			Wet Density	**125.5**	**pcf**
			Dry Density	**113.1**	**pcf**

Final

Diameter:	10.18	cm	Area, A:	81.4	sq cm
Height, L:	5.26	cm	Volume, V:	428.1	cu cm
Mass of Sample:	875.50	g	**Moisture Content:**	**21.5**	**%**
			Wet Density	**127.6**	**pcf**
			Dry Density	**105.0**	**pcf**
			Deg of Saturation	**93.4**	

Test Data

Permeant:	De-aired Tap Water
Cell Pressure	80.0 psi
Top Pressure	75.0 psi
Bottom Pressure	77.2 psi
Gradient:	29.5

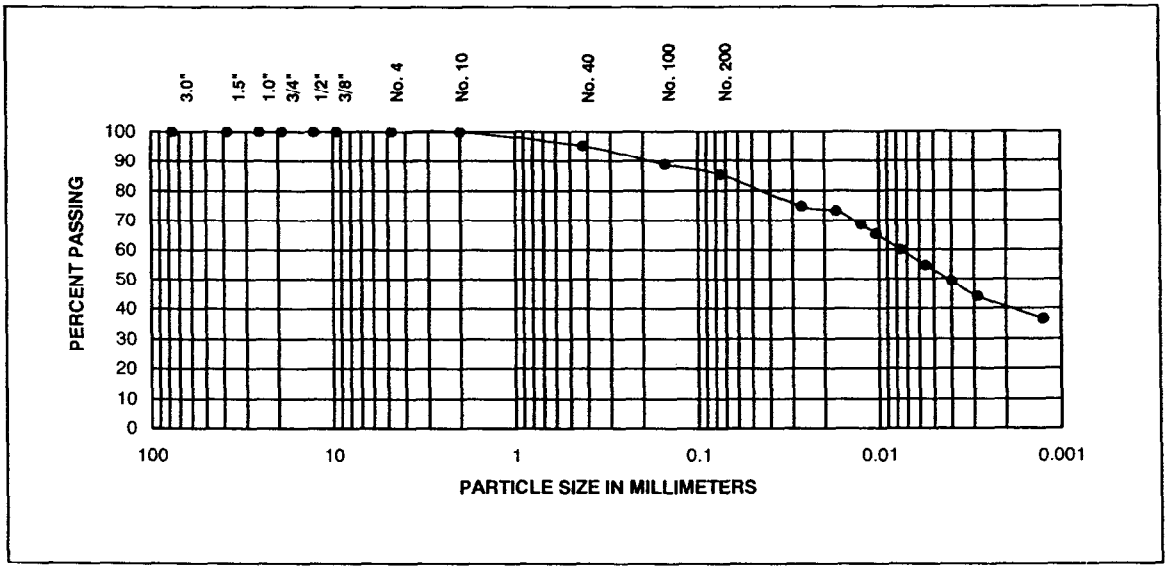
Date	Time	Elapsed Time (Sec)	Cumulative Time (Sec)	Burette Readings		Outflow/Inflow Ratio	Fluid Temp. oC	Permeability cm/sec
				Outflow cc	Inflow cc			
2/25/2003	10:39 AM	0	0	2.92	5.75		20.0	---
2/25/2003	11:14 AM	2100	2100	3.00	5.65	0.8	20.0	1.77E-08
2/25/2003	11:50 AM	2160	4260	3.07	5.58	1.0	20.0	1.21E-08
2/25/2003	12:20 PM	1800	6060	3.12	5.53	1.0	20.0	1.04E-08
2/25/2003	12:40 PM	1200	7260	3.16	5.49	1.0	20.0	1.26E-08
						Average Permeability =		**1.3E-08** **cm/sec**

Remarks:

Great Lakes Soil & Environmental Consultants, Inc. 333 Shore Drive, Burr Ridge, IL 60521 Ph: (630) 321-0944 Fax: (630) 321-0945	GRAIN SIZE ANALYSIS (ASTM D422)

Project	Supply Side Landfill						
Client	Versar, Inc. 200 West 22nd Street, Ste. 250, Lombard, IL 60148 Attn.: Mr. John Angstmann						
File No.	2555	**Sample #**	Loc-1	**Date Tested**	2/14/2003	**Tested by**	NP
						Qc by	SB

Date Sample Received:	2/7/2003
Sample Location	#1
Sample Description	Brown silty clay



			Fines	
% + 3"	**% Gravel**	**% Sand**	**% Silt**	**% Clay**
0.0	0.0	14.6	32.7	52.7

	D60(mm)	D30(mm)	D10(mm)	Cu	Cc
For coarse-grained soils with <12% Fines					

Sieve Size	Percent Passing
3.0"	100.0
1.5"	100.0
1.0"	100.0
3/4"	100.0
1/2"	100.0
3/8"	100.0
No. 4	100.0
No. 10	99.9
No. 40	95.2
No. 100	88.9
No. 200	85.4

Liquid Limit, L_L	Plastic Limit, PL	Plasticity Index, PI
35	16	19

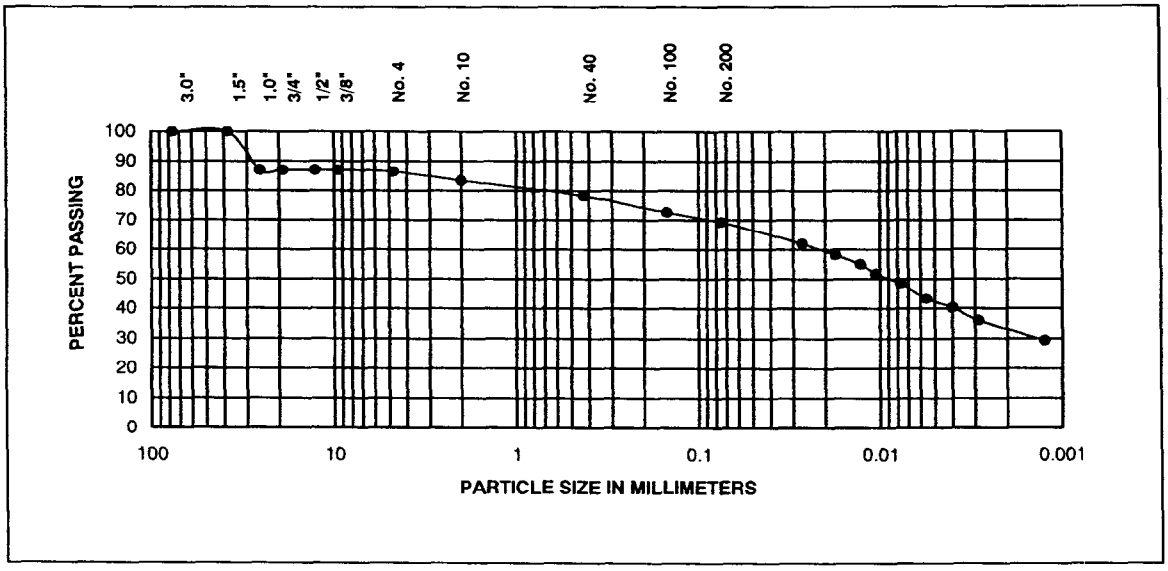
Soil Classification:	CL
Soil Description:	Lean clay
System:	USCS

Remarks:

Great Lakes Soil & Environmental Consultants, Inc. 333 Shore Drive, Burr Ridge, IL 60521 Ph: (630) 321-0944 Fax: (630) 321-0945	GRAIN SIZE ANALYSIS (ASTM D422)

Project	Supply Side Landfill						
Client	Versar, Inc. 200 West 22nd Street, Ste. 250, Lombard, IL 60148 Attn.: Mr. John Angstmann						
File No.	2555	**Sample #**	Loc-2	**Date Tested**	2/14/2003	**Tested by**	NP
						Qc by	SB

Date Sample Received:	2/7/2003
Sample Location	#2
Sample Description	Gray silty clay with traces of gravel



			Fines	
% + 3"	**% Gravel**	**% Sand**	**% Silt**	**% Clay**
0.0	13.6	17.1	26.7	42.6

For coarse-grained soils with <12% Fines	D60(mm)	D30(mm)	D10(mm)	Cu	Cc

Sieve Size	**Percent Passing**
3.0"	100.0
1.5"	100.0
1.0"	87.0
3/4"	87.0
1/2"	87.0
3/8"	87.0
No. 4	86.4
No. 10	83.5
No. 40	78.3
No. 100	72.6
No. 200	69.3

Liquid Limit, L_L	**Plastic Limit, PL**	**Plasticity Index, PI**
26	13	13

Soil Classification:	CL
Soil Description:	Sandy lean clay
System:	USCS

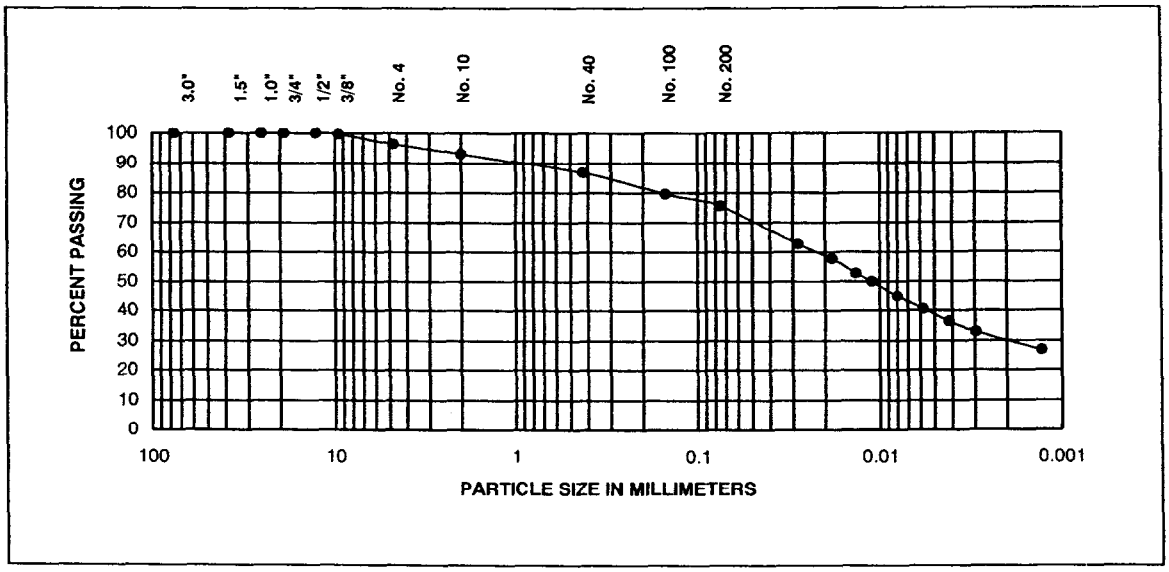
Remarks:

Quantity of Sample was not of required size.

Great Lakes Soil & Environmental Consultants, Inc. 333 Shore Drive, Burr Ridge, IL 60521 Ph: (630) 321-0944 Fax: (630) 321-0945	GRAIN SIZE ANALYSIS (ASTM D422)

Project	Supply Side Landfill						
Client	Versar, Inc. 200 West 22nd Street, Ste. 250, Lombard, IL 60148 Attn.: Mr. John Angstmann						
File No.	2555	**Sample #**	Loc-3	**Date Tested**	2/14/2003	**Tested by**	NP
						Qc by	SB

Date Sample Received:	2/7/2003
Sample Location	#3
Sample Description	Brown & Gray silty clay with traces of Gravel



			Fines	
% + 3"	**% Gravel**	**% Sand**	**% Silt**	**% Clay**
0.0	3.6	20.8	36.9	38.7

For coarse-grained soils with <12% Fines	D60(mm)	D30(mm)	D10(mm)	Cu	Cc

Sieve Size	**Percent Passing**
3.0"	100.0
1.5"	100.0
1.0"	100.0
3/4"	100.0
1/2"	100.0
3/8"	99.6
No. 4	96.4
No. 10	93.2
No. 40	86.8
No. 100	79.6
No. 200	75.6

Liquid Limit, L_L	**Plastic Limit, PL**	**Plasticity Index, PI**
25	14	11

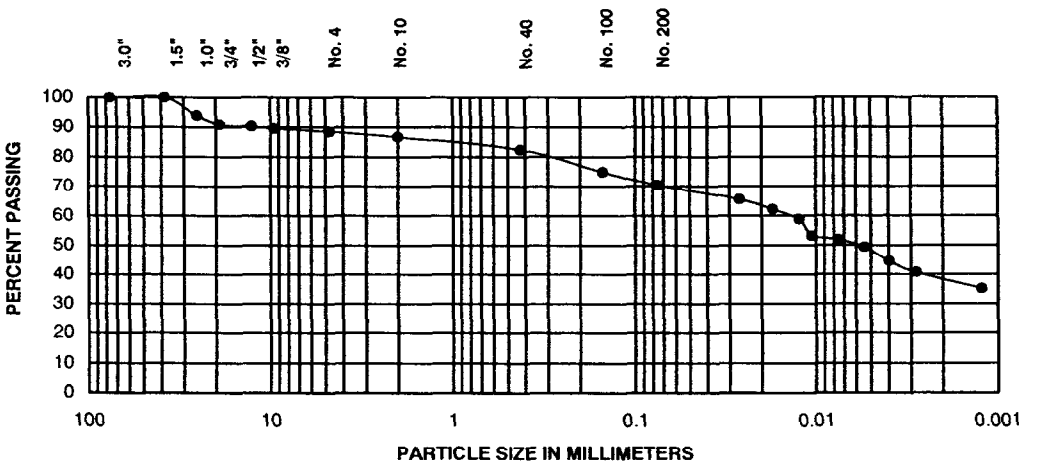
Soil Classification:	CL
Soil Description:	Lean clay with sand
System:	USCS

Remarks:

Great Lakes Soil & Environmental Consultants, Inc. 333 Shore Drive, Burr Ridge, IL 60521 Ph: (630) 321-0944 Fax: (630) 321-0945	GRAIN SIZE ANALYSIS (ASTM D422)

Project	Supply Side Landfill						
Client	Versar, Inc. 200 West 22nd Street, Ste. 250, Lombard, IL 60148 Attn.: Mr. John Angstmann						
File No.	2555	**Sample #**	Loc-4	**Date Tested**	2/14/2003	**Tested by**	NP
						Qc by	SB

Date Sample Received:	2/7/2003
Sample Location	#4
Sample Description	Brown silty clay with traces of Gravel



			Fines	
% + 3"	**% Gravel**	**% Sand**	**% Silt**	**% Clay**
0.0	11.5	18.0	22.9	47.6

	D60(mm)	D30(mm)	D10(mm)	Cu	Cc
For coarse-grained soils with <12% Fines					

Sieve Size	Percent Passing
3.0"	100.0
1.5"	100.0
1.0"	93.8
3/4"	90.9
1/2"	90.3
3/8"	89.5
No. 4	88.5
No. 10	86.8
No. 40	82.5
No. 100	74.8
No. 200	70.5

Liquid Limit, L_L	Plastic Limit, PL	Plasticity Index, PI
38	18	20

Soil Classification:	CL
Soil Description:	Lean clay with sand
System:	USCS

Remarks:

Great Lakes Soil & Environmental Consultants Inc.

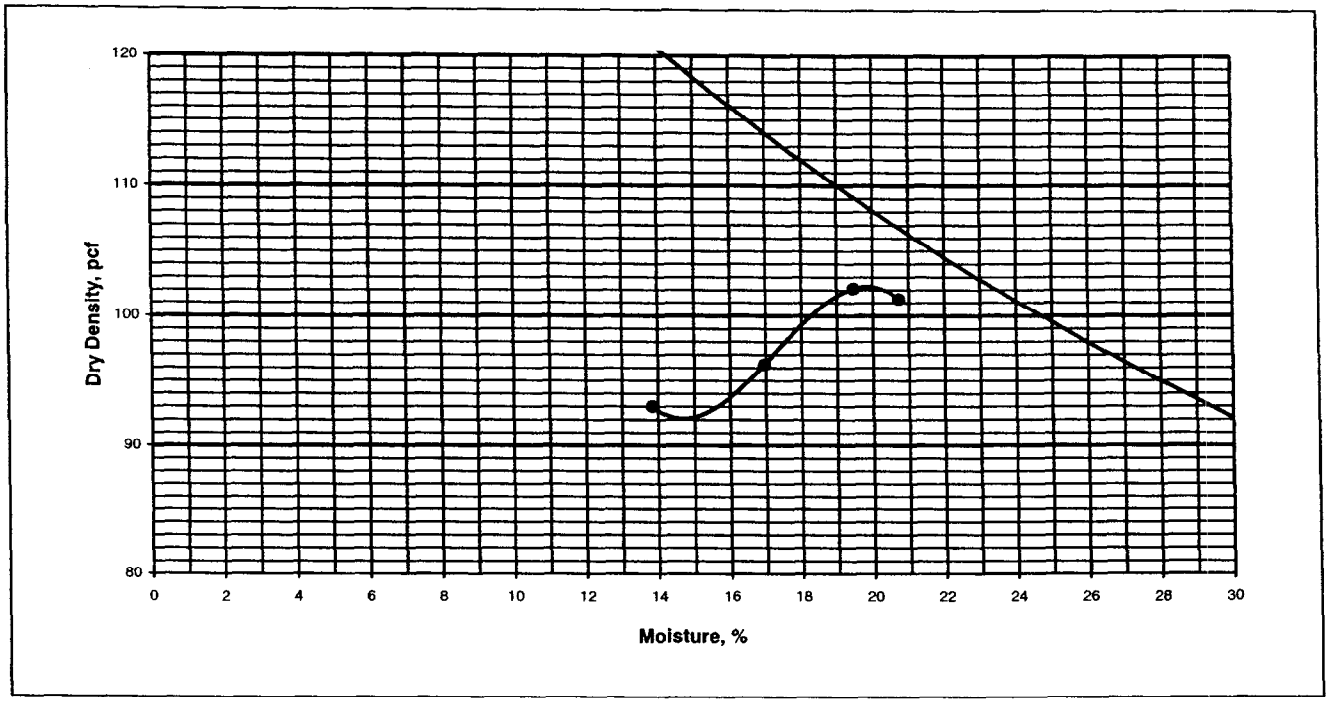
333 Shore Drive, Burr Ridge, IL 60521 Ph: (630) 321-0944 Fax: (630) 321-0945

MOISTURE - DENSITY RELATIONSHIP CURVE

ASTM D698-91

Project	Supply Side Landfill						
Client	Versar, Inc. 200 West 22nd Street, Ste. 250, Lombard, IL 60148 Attn.: Mr. John Angstmann						
File No.	2555	**Sample #**	Loc-1	**Date Tested**	2/11/2003	**Tested By**	MT
						Qc By	SB

Date Sample Recd.	2/7/03								
Sample Location	#1								
Sample Description	Brown silty clay								
Type of Proctor	Standard	**Method:**	A	**Mold Size, in.**	4	**Hammer Weight, lb.**	5.5	**Drop, in.**	12
No. of Layers	3	**No. of Blows per Layer**		25					



Zero Air Void Curve Specific Gravity: 2.65

Results

Maximum Dry Density, pcf	102.3	**Optimum Moisture Content, %**	19.9	**Natural Moisture Content, %**	15.7
Corrected Max. Dry Density, pcf		**Corrected Optimum Moisture Content, %**			

Remarks

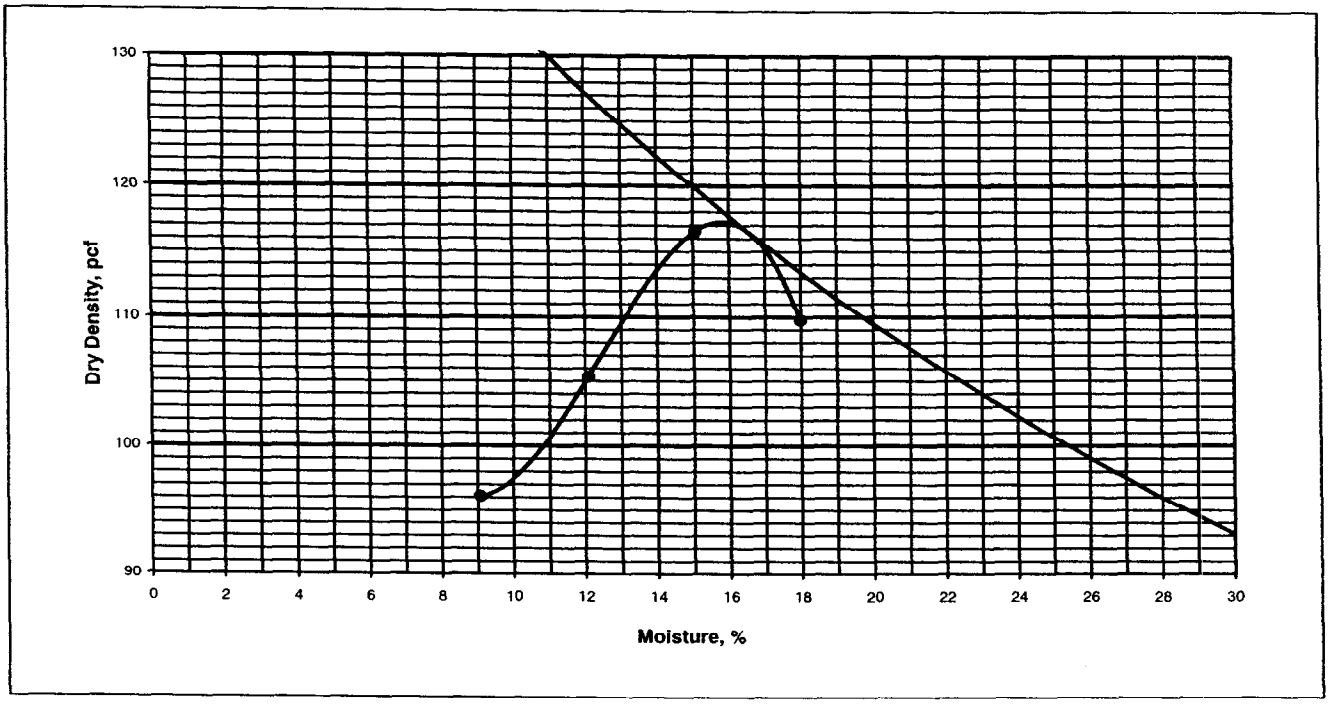
Great Lakes Soil & Environmental Consultants Inc.
333 Shore Drive, Burr Ridge, IL 60521 Ph: (630) 321-0944 Fax: (630) 321-0945

MOISTURE - DENSITY RELATIONSHIP CURVE

ASTM D698-91

Project	Supply Side Landfill						
Client	Versar, Inc. 200 West 22nd Street, Ste. 250, Lombard, IL 60148 Attn.: Mr. John Angstmann						
File No.	2555	**Sample #**	Loc-2	**Date Tested**	2/12/2003	**Tested By**	MT
						Qc By	SB

Date Sample Recd.	2/7/03								
Sample Location	#2								
Sample Description	Gray silty clay with traces of gravel								
Type of Proctor	Standard	**Method:**	A	**Mold Size, in.**	4	**Hammer Weight, lb.**	5.5	**Drop, in.**	12
No. of Layers	3	**No. of Blows per Layer**			25				



Zero Air Void Curve Specific Gravity: 2.70

Results

Maximum Dry Density, pcf	117.3	**Optimum Moisture Content, %**	16.0	**Natural Moisture Content, %**	4.7
Corrected Max. Dry Density, pcf		**Corrected Optimum Moisture Content, %**			

Remarks

Great Lakes Soil & Environmental Consultants Inc.

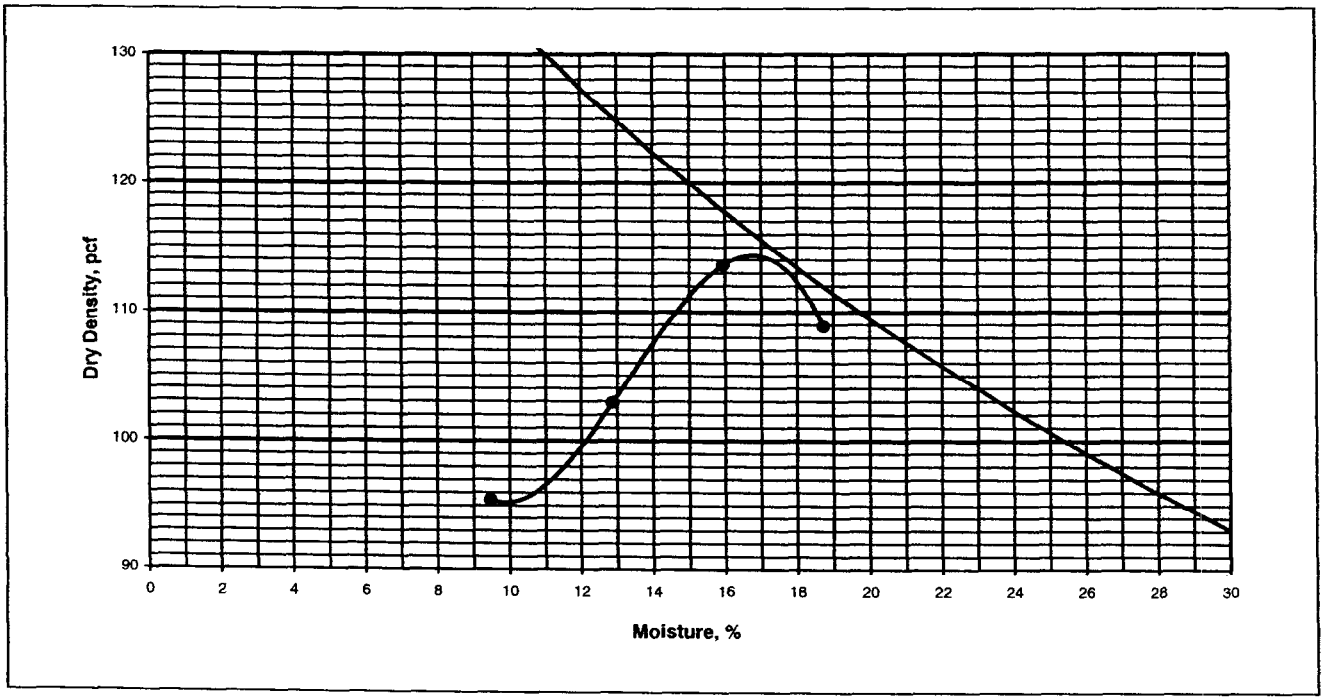
333 Shore Drive, Burr Ridge, IL 60521 Ph: (630) 321-0944 Fax: (630) 321-0945

MOISTURE - DENSITY RELATIONSHIP CURVE

ASTM D698-91

Project	Supply Side Landfill						
Client	Versar, Inc. 200 West 22nd Street, Ste. 250, Lombard, IL 60148 Attn.: Mr. John Angstmann						
File No.	2555	**Sample #**	Loc-3	**Date Tested**	2/11/2003	**Tested By**	MT
						Qc By	SB

Date Sample Recd.	2/7/03								
Sample Location	#3								
Sample Description	Brown & Gray silty clay with traces of Gravel								
Type of Proctor	Standard	**Method:**	A	**Mold Size, in.**	4	**Hammer Weight, lb.**	5.5	**Drop, in.**	12
No. of Layers	3	**No. of Blows per Layer**		25					



Zero Air Void Curve Specific Gravity: 2.70

Results

Maximum Dry Density, pcf	114.5	**Optimum Moisture Content, %**	16.7	**Natural Moisture Content, %**	15.8
Corrected Max. Dry Density, pcf		**Corrected Optimum Moisture Content, %**			

Remarks

Great Lakes Soil & Environmental Consultants Inc.

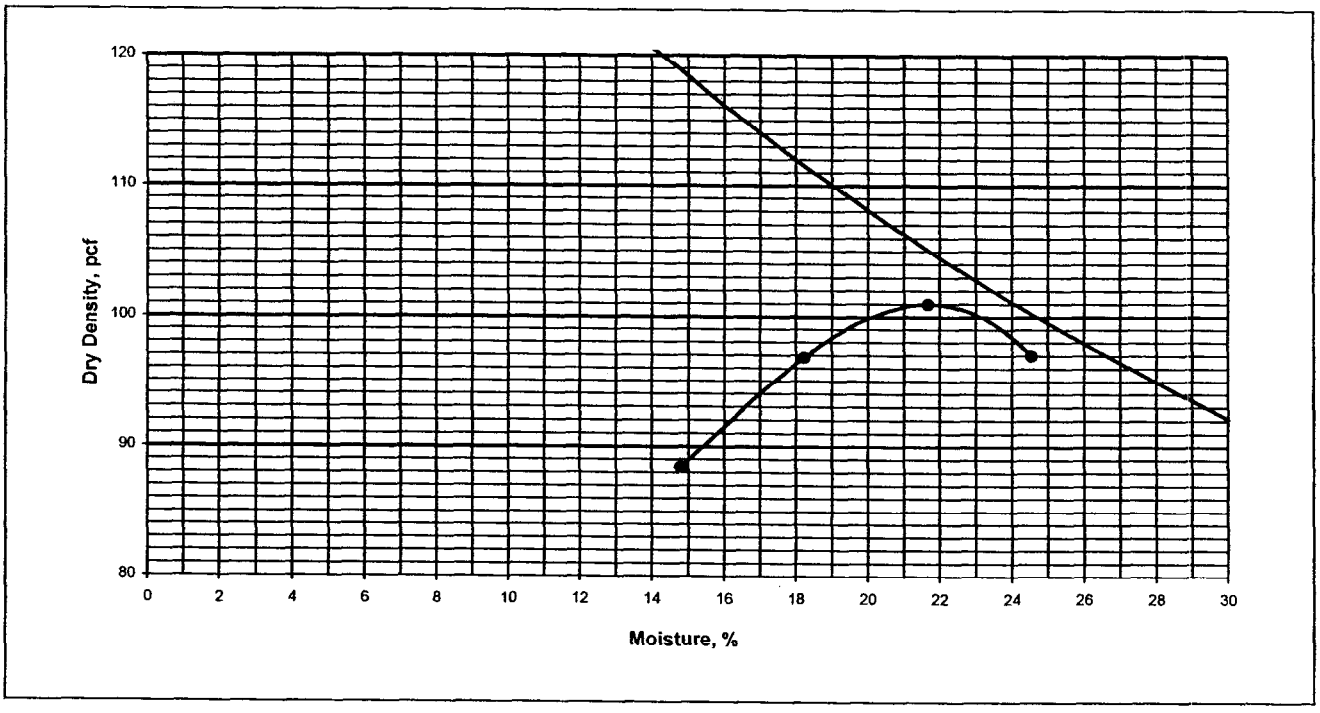
333 Shore Drive, Burr Ridge, IL 60521 Ph: (630) 321-0944 Fax: (630) 321-0945

MOISTURE - DENSITY RELATIONSHIP CURVE

ASTM D698-91

Project	Supply Side Landfill						
Client	Versar, Inc. 200 West 22nd Street, Ste. 250, Lombard, IL 60148 Attn.: Mr. John Angstmann						
File No.	2555	**Sample #**	Loc-4	**Date Tested**	2/14/2003	**Tested By**	MT
						Qc By	SB

Date Sample Recd.	2/7/03								
Sample Location	#4								
Sample Description	Brown silty clay with traces of Gravel								
Type of Proctor	Standard	**Method:**	A	**Mold Size, in.**	4	**Hammer Weight, lb.**	5.5	**Drop, in.**	12
No. of Layers	3	**No. of Blows per Layer**			25				



Zero Air Void Curve Specific Gravity: 2.65

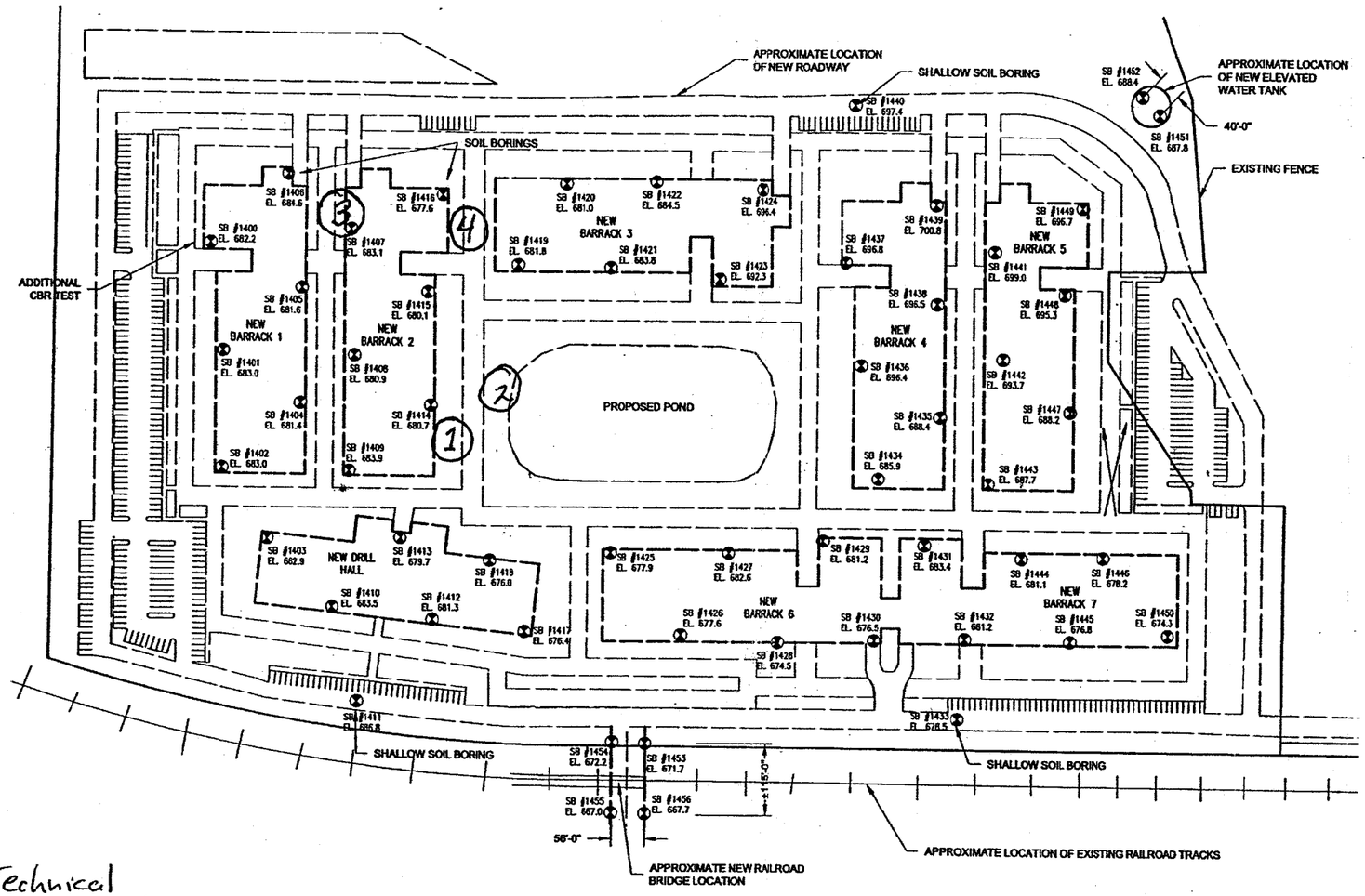
Results

Maximum Dry Density, pcf	**101.0**	**Optimum Moisture Content, %**	**21.7**	**Natural Moisture Content, %**	**18.5**
Corrected Max. Dry Density, pcf		**Corrected Optimum Moisture Content, %**			

Remarks

Figure 1

SHEET 1 OF 1



○ Geotechnical Sample Location

SEE PLAN DRAWING FILE VAPB101Y.dwg FOR TOPOGRAPHY AND OTHER FEATURES

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APPROXIMATE SCALE IN FEET

100 0 100 200

FIGURE 5-1 – BORING LOCATION PLAN

NTC GREAT LAKES COMPLEX
VA PROPERTY SOILS INVESTIGATION

HANSON ENGINEERS INCORPORATED
1525 SOUTH SIXTH STREET SPRINGFIELD, IL 62703

JOB NO. 01S3009

DATE 7/23/01

DRAWN	Y	06/	
REVIEWED	DDD	06/	
APPROVED		07/23/0	

X:\01JOBS\01S3009\VAPB101Y.DWG JUL 19, 2001 2:16PM LJP

CONFORMED SPECIFICATIONS

APPENDIX H

HELP MODELING DATA

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**                                                                          **
**                                                                          **
**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE               **
**                   HELP MODEL VERSION 3.07  (1 NOVEMBER 1997)             **
**                   DEVELOPED BY ENVIRONMENTAL LABORATORY                  **
**                     USAE WATERWAYS EXPERIMENT STATION                    **
**                FOR USEPA RISK REDUCTION ENGINEERING LABORATORY           **
**                                                                          **
**                                                                          **
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PRECIPITATION DATA FILE:     C:\WMA\PROGRA~1\HELP3\P0730.D4
TEMPERATURE DATA FILE:       C:\WMA\PROGRA~1\HELP3\T0730.D7
SOLAR RADIATION DATA FILE:   C:\WMA\PROGRA~1\HELP3\S0730.D13
EVAPOTRANSPIRATION DATA:     C:\WMA\PROGRA~1\HELP3\E0730.D11
SOIL AND DESIGN DATA FILE:   C:\WMA\PROGRA~1\HELP3\ESD0729.D10
OUTPUT DATA FILE:            C:\WMA\PROGRA~1\HELP3\EO0730.OUT


TIME:  10:56     DATE:   7/30/2003


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     TITLE:  Existing Cap 0630

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NOTE: INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.

LAYER 1

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 10

THICKNESS	=	12.00	INCHES
POROSITY	=	0.3980	VOL/VOL
FIELD CAPACITY	=	0.2440	VOL/VOL
WILTING POINT	=	0.1360	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.2815	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.119999997000E-03	CM/SEC

NOTE: SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY 1.80 FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.

LAYER 2

TYPE 3 - BARRIER SOIL LINER
MATERIAL TEXTURE NUMBER 13

THICKNESS	=	24.00	INCHES
POROSITY	=	0.4300	VOL/VOL
FIELD CAPACITY	=	0.3210	VOL/VOL
WILTING POINT	=	0.2210	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.4300	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.330000003000E-04	CM/SEC

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT SOIL DATA BASE USING SOIL TEXTURE #10 WITH A POOR STAND OF GRASS, A SURFACE SLOPE OF 3.% AND A SLOPE LENGTH OF 150. FEET.

SCS RUNOFF CURVE NUMBER	=	90.40	
FRACTION OF AREA ALLOWING RUNOFF	=	70.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	11.000	ACRES
EVAPORATIVE ZONE DEPTH	=	6.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	1.914	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	2.388	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	0.816	INCHES
INITIAL SNOW WATER	=	0.000	INCHES
INITIAL WATER IN LAYER MATERIALS	=	13.698	INCHES
TOTAL INITIAL WATER	=	13.698	INCHES
TOTAL SUBSURFACE INFLOW	=	0.00	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM CHICAGO ILLINOIS

STATION LATITUDE	=	41.78	DEGREES
MAXIMUM LEAF AREA INDEX	=	1.00	
START OF GROWING SEASON (JULIAN DATE)	=	117	
END OF GROWING SEASON (JULIAN DATE)	=	290	
EVAPORATIVE ZONE DEPTH	=	6.0	INCHES

AVERAGE ANNUAL WIND SPEED = 10.30 MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY = 71.00 %
AVERAGE 2ND QUARTER RELATIVE HUMIDITY = 65.00 %
AVERAGE 3RD QUARTER RELATIVE HUMIDITY = 70.00 %
AVERAGE 4TH QUARTER RELATIVE HUMIDITY = 72.00 %

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR CHICAGO ILLINOIS

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
1.60	1.31	2.59	3.66	3.15	4.08
3.63	3.53	3.35	2.28	2.06	2.10

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR CHICAGO ILLINOIS

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
21.40	26.00	36.00	48.80	59.10	68.60
73.00	71.90	64.70	53.50	39.80	27.70

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR CHICAGO ILLINOIS
AND STATION LATITUDE = 41.78 DEGREES

****

AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 30

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	1.47	1.46	2.39	3.26	3.34	4.22
	3.43	3.42	3.11	2.19	2.10	2.22
STD. DEVIATIONS	0.68	0.71	1.18	1.52	1.65	2.14
	1.83	1.76	1.76	1.22	1.06	0.97
RUNOFF						
TOTALS	0.278	0.967	1.615	0.337	0.131	0.284
	0.277	0.304	0.219	0.066	0.060	0.172
STD. DEVIATIONS	0.418	0.721	1.209	0.419	0.277	0.382
	0.363	0.293	0.265	0.099	0.092	0.251
EVAPOTRANSPIRATION						
TOTALS	0.539	0.449	0.768	2.370	2.497	2.764
	2.371	2.219	1.801	1.376	1.080	0.625
STD. DEVIATIONS	0.121	0.087	0.426	0.857	0.961	0.994
	0.962	1.031	0.818	0.677	0.294	0.198

PERCOLATION/LEAKAGE THROUGH LAYER 2

TOTALS	0.0243	0.1738	1.2234	1.0722	0.7083	1.0809
	0.9011	0.9136	1.0481	0.6808	0.8732	0.3418
STD. DEVIATIONS	0.0720	0.2329	0.5173	0.8367	0.7952	0.8207
	0.7418	0.7323	0.9264	0.7041	0.7712	0.4510

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 2

AVERAGES	0.0007	0.0049	0.0547	0.0416	0.0197	0.0384
	0.0288	0.0309	0.0301	0.0184	0.0224	0.0082
STD. DEVIATIONS	0.0019	0.0066	0.0285	0.0338	0.0236	0.0454
	0.0392	0.0314	0.0343	0.0214	0.0182	0.0119

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 30

	INCHES	CU. FEET	PERCENT
PRECIPITATION	32.60 (5.565)	1301585.0	100.00
RUNOFF	4.710 (1.7412)	188074.55	14.450
EVAPOTRANSPIRATION	18.859 (3.1609)	753021.19	57.854
PERCOLATION/LEAKAGE THROUGH	9.04141 (2.21536)	361023.656	27.73723

LAYER 2

AVERAGE HEAD ON TOP OF LAYER 2	0.025	(0.008)		
CHANGE IN WATER STORAGE	-0.013	(1.3083)	-534.60	-0.041

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PEAK DAILY VALUES FOR YEARS 1 THROUGH 30

	(INCHES)	(CU. FT.)
PRECIPITATION	4.09	163313.703
RUNOFF	1.475	58883.5469
PERCOLATION/LEAKAGE THROUGH LAYER 2	1.334315	53279.18750
AVERAGE HEAD ON TOP OF LAYER 2	4.529	
SNOW WATER	4.86	194148.0780
MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.3980	
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.1360	

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FINAL WATER STORAGE AT END OF YEAR 30

LAYER	(INCHES)	(VOL/VOL)
1	2.6596	0.2216
2	10.3200	0.4300
SNOW WATER	0.316	

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**                                                                          **
**                                                                          **
**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE               **
**                 HELP MODEL VERSION 3.07  (1 NOVEMBER 1997)               **
**                    DEVELOPED BY ENVIRONMENTAL LABORATORY                 **
**                      USAE WATERWAYS EXPERIMENT STATION                   **
**                FOR USEPA RISK REDUCTION ENGINEERING LABORATORY           **
**                                                                          **
**                                                                          **
******************************************************************************
******************************************************************************

PRECIPITATION DATA FILE:     C:\WMA\PROGRA~1\HELP3\P0630.D4
TEMPERATURE DATA FILE:       C:\WMA\PROGRA~1\HELP3\T0630.D7
SOLAR RADIATION DATA FILE:   C:\WMA\PROGRA~1\HELP3\S0630.D13
EVAPOTRANSPIRATION DATA:     C:\WMA\PROGRA~1\HELP3\E0630.D11
SOIL AND DESIGN DATA FILE:   C:\WMA\PROGRA~1\HELP3\SD0630.D10
OUTPUT DATA FILE:            C:\WMA\PROGRA~1\HELP3\O0630.OUT


TIME:   9: 7     DATE:   6/30/2003


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     TITLE:  New Cap 063003

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NOTE: INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.

LAYER 1

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 10

THICKNESS	=	6.00	INCHES
POROSITY	=	0.3980	VOL/VOL
FIELD CAPACITY	=	0.2440	VOL/VOL
WILTING POINT	=	0.1360	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.3931	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.119999997000E-03	CM/SEC

NOTE: SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY 1.80 FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.

LAYER 2

TYPE 3 - BARRIER SOIL LINER
MATERIAL TEXTURE NUMBER 16

THICKNESS	=	18.00	INCHES
POROSITY	=	0.4270	VOL/VOL
FIELD CAPACITY	=	0.4180	VOL/VOL
WILTING POINT	=	0.3670	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.4270	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.100000001000E-06	CM/SEC

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT SOIL DATA BASE USING SOIL TEXTURE #10 WITH A GOOD STAND OF GRASS, A SURFACE SLOPE OF 4.% AND A SLOPE LENGTH OF 520. FEET.

SCS RUNOFF CURVE NUMBER	=	80.10	
FRACTION OF AREA ALLOWING RUNOFF	=	95.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	11.000	ACRES
EVAPORATIVE ZONE DEPTH	=	6.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	2.359	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	2.388	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	0.816	INCHES
INITIAL SNOW WATER	=	0.000	INCHES
INITIAL WATER IN LAYER MATERIALS	=	10.045	INCHES
TOTAL INITIAL WATER	=	10.045	INCHES
TOTAL SUBSURFACE INFLOW	=	0.00	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM CHICAGO ILLINOIS

STATION LATITUDE	=	41.78	DEGREES
MAXIMUM LEAF AREA INDEX	=	1.00	
START OF GROWING SEASON (JULIAN DATE)	=	117	
END OF GROWING SEASON (JULIAN DATE)	=	290	
EVAPORATIVE ZONE DEPTH	=	6.0	INCHES

AVERAGE ANNUAL WIND SPEED = 10.30 MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY = 71.00 %
AVERAGE 2ND QUARTER RELATIVE HUMIDITY = 65.00 %
AVERAGE 3RD QUARTER RELATIVE HUMIDITY = 70.00 %
AVERAGE 4TH QUARTER RELATIVE HUMIDITY = 72.00 %

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR CHICAGO ILLINOIS

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
1.60	1.31	2.59	3.66	3.15	4.08
3.63	3.53	3.35	2.28	2.06	2.10

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR CHICAGO ILLINOIS

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
21.40	26.00	36.00	48.80	59.10	68.60
73.00	71.90	64.70	53.50	39.80	27.70

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR CHICAGO ILLINOIS
AND STATION LATITUDE = 41.78 DEGREES

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 30

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	1.47	1.46	2.39	3.26	3.34	4.22
	3.43	3.42	3.11	2.19	2.10	2.22
STD. DEVIATIONS	0.68	0.71	1.18	1.52	1.65	2.14
	1.83	1.76	1.76	1.22	1.06	0.97
RUNOFF						
TOTALS	0.436	1.359	2.209	0.869	0.278	0.492
	0.431	0.474	0.521	0.360	0.498	0.558
STD. DEVIATIONS	0.543	0.969	1.649	0.961	0.803	0.917
	0.820	0.565	0.759	0.542	0.690	0.566
EVAPOTRANSPIRATION						
TOTALS	0.539	0.449	0.839	3.048	3.126	3.435
	3.199	2.912	2.278	1.698	1.110	0.645
STD. DEVIATIONS	0.120	0.087	0.500	0.773	1.137	1.259
	1.346	1.419	1.084	0.645	0.330	0.197
PERCOLATION/LEAKAGE THROUGH LAYER 2						

TOTALS	0.0961	0.0600	0.1001	0.0900	0.0535	0.0561
	0.0433	0.0355	0.0509	0.0817	0.0897	0.1043
STD. DEVIATIONS	0.0336	0.0331	0.0238	0.0304	0.0253	0.0257
	0.0240	0.0269	0.0348	0.0396	0.0451	0.0399

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 2

AVERAGES	0.5209	0.2158	1.2151	2.1888	0.9637	1.0699
	0.7916	0.7642	1.2326	1.9423	2.6907	2.3214
STD. DEVIATIONS	0.4371	0.2819	0.7565	1.2626	0.8445	0.6277
	0.5796	0.6446	1.0636	1.4541	1.7095	1.2328

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 30

	INCHES	CU. FEET	PERCENT
PRECIPITATION	32.60 (5.565)	1301585.0	100.00
RUNOFF	8.486 (3.2452)	338830.47	26.032
EVAPOTRANSPIRATION	23.279 (3.8095)	929519.25	71.414
PERCOLATION/LEAKAGE THROUGH	0.86113 (0.15376)	34384.961	2.64178

LAYER 2

AVERAGE HEAD ON TOP OF LAYER 2	1.326 (	0.310)		
CHANGE IN WATER STORAGE	-0.029	(1.3881)	-1149.75	-0.088

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PEAK DAILY VALUES FOR YEARS 1 THROUGH 30

	(INCHES)	(CU. FT.)
PRECIPITATION	4.09	163313.703
RUNOFF	2.790	111395.8670
PERCOLATION/LEAKAGE THROUGH LAYER 2	0.004535	181.09744
AVERAGE HEAD ON TOP OF LAYER 2	6.000	
SNOW WATER	4.86	194148.0780

MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.3980
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.1360

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FINAL WATER STORAGE AT END OF YEAR 30

LAYER	(INCHES)	(VOL/VOL)
1	1.1785	0.1964
2	7.6860	0.4270
SNOW WATER	0.316	

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APPENDIX I

EROSION CONTROL PLAN

SUPPLY SIDE LANDFILL
EROSION CONTROL AND VEGETATION PLAN

1.0 EROSION CONTROL AND VEGETATION PLAN

This narrative presents the erosion control and vegetation plan for the regrading and cover application activities at the Supply Side Landfill. The plan addresses short-term and long-term erosion controls, and surface water management plans for the landfill.

1.1 Long-Term Erosion Control and Surface Water Management Measures

The upper layer of the cover system will be a 6-inch thick layer of soil capable of supporting vegetative growth. The vegetation shall be a typical seed mixture, appropriate for the area, consisting of bluegrass and fescue as indicated in the project specifications.

Disturbed portions of the site where construction activities permanently cease will be stabilized no later than 14 days after the last construction activity. The seed will be applied to the disturbed areas via a hydroseed application with fertilizer and mulch. A coconut fiber or straw erosion control blanket will be applied to steeper sideslope areas.

In addition to the vegetated surface, the regrading contoured landform is planned in such a way as to minimize erosion and provide surface water management. The extent of steep sideslope areas have been minimized and the vast majority of the landfill area (i.e., top slope area) will be at a very gradual slope. Surface water runoff resulting from precipitation over the vast majority of the site area will be sheet flow. Even though the slope is relatively short, the addition of a bench has been incorporated into the west and south steeper sideslope area to break-up the surface water flow down this slope.

Existing drainage ways located at the south and east perimeter of the landfill will collect and convey runoff from the site. Runoff to the west will be directed to an existing natural drainage collection

area, while runoff to the north from a very small contributing side slope area will be directed to existing vacant land and driveway area.

Erosion control measures such as straw bales, silt fence, or other features will be utilized as necessary.

1.2 Short-Term Erosion Control Measures

Prior to development activity, silt fencing will be installed along all downslope sections of the limits of construction disturbance to prevent sediment from leaving the site. In addition, erosion control measures such as straw bales, silt fence, diversions, or other features will be utilized where necessary to prevent sediment from leaving the site (Drawing 8).

APPENDIX J

MATERIAL SPECIFICATIONS

MATERIAL AND PLACEMENT SPECIFICATIONS FOR FINAL COVER SYSTEM SUPPLY SIDE LANDFILL NAVAL STATION GREAT LAKES GREAT LAKES, IL

GENERAL FILL FOR PANHANDLE AREA: Soil obtained from on-site sources, and off- site sources if necessary. The soil obtained should be free of organic material and other debris such as waste, cinders, glass etc. Maximum particle dimension should be 3 inches.

SUBGRADE & SITE REGRADING: The subgrade shall be capable of supporting the construction of the cover system without excessive deformation and shall be stable under the loading applied by the filling operations. Grade to lines and grades shown on the Drawings. Finish grade should have a gentle slope and ensure free drainage as shown on Drawings.

COMPACTED LOW PERMEABILITY FINAL COVER SOIL: Place a minimum of 18 inches of cover material. The low permeability final cover soil shall meet the following specifications:

A. The soil shall be free of organic material and other debris. No frozen material.
B. Maximum particle size shall be 4 inches.
C. Prior to placement of first lift of soil, ensure vegetation and debris has been removed from the surface and the work area has been scarified and ready for low permeability soil placement.
D. Compaction and remolding of soils shall be performed using a sheep foot compactor with compactor feet at least as long as the compacted lift thickness to facilitate bonding between lifts. Additionally, prior to the placement of a successive lift, the surface of the constructed liner shall be prepared by scarifying to facilitate bonding between lifts. The constructed cover shall have a maximum permeability of 1×10^{-7} cm/sec.
E. Areas not meeting the specified requirements, such as density or moisture content tests that do not fall within the acceptable zone, and areas which have become too wet due to precipitation shall be scarified and reworked and replaced.
F. Place cover soils such that percent compaction and moisture content are within the acceptable zone.
G. When construction joints in the low permeable final cover are necessary, "stepping" or "keying" the segments of the layer together will be required. All vertical soil joints shall be kept to a minimum.
H. Grade to lines and grades shown on the Drawings.

VEGETATIVE FINAL COVER SOIL: Place a minimum of 6 inches of soil capable of supporting vegetative growth. Do not compact the topsoil during placement. Grade to lines and grades shown on the Drawings ensuring free drainage.

SEEDING: Seeding should not be done prior to application of vegetative soil. Do not seed on saturated or frozen soil. Seeding shall be accomplished via a hydroseed application. Seed mix shall consist of 20 lbs/acre of bluegrass and 20 lbs/acre of fescue. Hydroseed application of seed shall be accompanied by fertilizer and mulch.

GEOTEXTILE: Provide a non-woven product comprised of polyester or polypropylene.

Geotextile shall have a nominal mass per unit area of 8 oz/sy. Meet ASTM D-5261.

ROAD AGGREGATE: Place a minimum 12" thick layer of a clean round or crushed coarse aggregate to build the road surface. Placement shall be accomplished in one lift. Check the sub grade for soundness, grade, and cross-section. Construct crushed aggregate road to the lines and grades shown in the Drawings.

GAS SYSTEM COMPONENTS:

HDPE PIPE: HDPE SDR 17 Pipe and HDPE SDR 11 Fittings shall be used for the gas system trench piping. Meet ASTM D-3350. The HDPE perforated pipe sections shall be installed with the perforated face down. The pipe shall be perforated with approximately 3/8" diameter holes spaced 45 degrees apart for ½ of the pipe circumference.

PVC PIPE: PVC Schedule 80 Pipe and Fittings shall be used for all gas system trench risers. Meet ASTM D-1784. PVC Bell End Pipe shall be used.

FLEXIBLE MEMBRANE LINER: Provide a flexible membrane liner comprised of LLDPE, HDPE, or equivalent. Membrane liner shall have a nominal thickness of 40 mils. Meet ASTM D-5199. Overlap at seams a minimum of 18"; welding of seams is not required.

CMP CASING: Provide corrugated metal pipe (CMP) casing for all gas system pipe casings under roadway crossings. The CMP shall be constructed of 12 gauge steel with a diameter of 12".

OTHER SYSTEM COMPONENTS: Refer to construction drawings for further detail and specifications pertaining to other system components.

SURVEY CONTROL: Record surveys of top of each layer of final cover system, including top of regraded existing surface. Provide an as-built verification survey for the following layers within five working days after construction of the layer has been completed:

a. Regraded existing surface,
b. Top of compacted low permeability soil layer, and
c. Top of vegetative soil layer.

APPENDIX K

MATERIAL QUANTITY CALCULATIONS

Table K-1
Construction Materials Calculations
Supply Side Landfill
Naval Station Great Lakes
Great Lakes, IL

Description	Estimated Quantity	Unit
Regrading Area	14.6	acres
Regrade Existing Surface (Fill Volume)	31,000	cy
Regrade Existing Surface (Cut Volume)*	34,500	cy
Panhandle Area (Fill Volume)	5,500	cy
Compacted Low Permeability Soil	35,400	cy
Vegetative Soil	11,800	cy
Gas Collection Trenches	2,500	LF
Gravel Filled Bore Holes	450	LF
Corrugated Metal Pipe Casing	260	LF
Road Surfaces	926	cy

Notes:

* Includes 5,700 cy cut volume from panhandle area.

APPENDIX L

CONSTRUCTION QUALITY ASSURANCE MANUAL

CONSTRUCTION QUALITY ASSURANCE MANUAL
SUPPLY SIDE LANDFILL
NAVAL STATION GREAT LAKES
GREAT LAKES, IL

1.0 INTRODUCTION

Development and construction of final cover improvement will be monitored in accordance with the requirements of the construction quality assurance (CQA) program described in the following sections. Performance of CQA activities will confirm that the construction is done in accordance with the design through random testing of materials, verification that materials meet design specifications, and documenting that specified construction procedures are followed.

2.0 PERSONNEL

Prior to initiation of construction activities, a CQA Officer will be designated. The CQA Officer will be a professional engineer registered in the State of Illinois, who is a person other than the operator or an employee of the operator, and who will supervise and be responsible for all inspection, testing, and other activities required to be implemented as a part of the CQA plan. The CQA Officer will also be responsible for, and will provide direct supervision to, a staff of engineers and/or engineering technician (inspectors) who will perform the testing, sampling, and inspection and testing of the construction/installation of all structures, as described more specifically in Sections 3, 4, 5, and 6 of this document. The CQA Officer must be present at the outset of major undertakings and at critical times during the construction. The time that the CQA Officer must be at the landfill will be dependent upon the type of construction being conducted. The CQA Officer must exercise his/her own professional judgment to be present at the landfill as required to assume full responsibility for the inspection and testing performed by those persons under his/her direct supervision. The CQA Officer's staff will be on-site full-time for all of the construction activities specified herein.

If the CQA Officer is unable to be present to perform duties as outlined, then the CQA Officer will provide, in writing, reasons for his/her absence and a designation of the person who will exercise professional judgment in carrying out duties as the designated CQA Officer-in-absentia. A signed statement will be provided and recorded that the CQA Officer assumes full responsibility for all inspections performed and reports prepared by the designated CQA Officer-in-absentia during any absence of CQA officer.

The operator may, at his/her discretion, appoint a separate CQA Officers for the construction of different facility components, for example, a different CQA Officer for installation of the geomembrane or a different CQA Officer for the construction of the gas management system.

3.0 INSPECTION ACTIVITIES

At a minimum, it is required that the CQA Officer, or his/her designated representative, be present to observe and document the following construction activities:

- Excavation and grading activities.
- Placement of final cover materials.

- Installation of gas control facilities.

4.0 PRECONSTRUCTION TESTING PROGRAM

Prior to the construction of a final cover system barrier, preconstruction testing shall be performed to evaluate the materials and confirm the adequacy of earthen materials from each on-site or off-site source area. Testing to confirm the adequacy of the low permeability cover materials shall be performed on each material from each source area. All tests shall be documented, and the materials shall be accepted or rejected by the CQA Officer, or his/her designated representative, based on the criteria specified in Table L-1 - Material Testing Requirements and Frequency.

4.1 Low Permeability Soil Cover Materials

Potential borrow sources for use in the cohesive soil cover will be tested and evaluated for suitability prior to construction. Materials shall be classified according to the Unified Soil Classification System.

After identifying cover sources, a family of moisture-density curves and permeabilities will be developed for use as a field reference. These data will be compiled from the laboratory test data and will correlate soil densities to permeabilities. By compiling these data, the need for continuous borrow source testing is reduced. The family of curves can be used as a reference to compare the field results to known changes in materials. If borrow materials change relative to the referenced family of curves and lab data, a sample of the new material will be sent to the laboratory for evaluation. New test results will be added to the family of data, thereby updating the reference curves. The appropriate testing criteria for cover acceptance are shown on Table L-1.

4.2 Landfill Gas Management System

The landfill gas management system design provides specifications for piping material. These materials may be substituted with other piping material which possesses properties meeting or exceeding the materials specified in the design. The CQA Officer, or his/her designated representative, shall ensure the piping material delivered to the facility have been conformance tested and certified by the manufacturer as meeting the manufacturer's specifications, and will obtain testing certifications from the manufacturer. The CQA Officer, or his/her designated representative, shall verify that the piping material and installation conforms to the design plans.

4.3 Geotextiles

As specified in Table L-1 - Material Testing Requirements, the CQA Officer, or his/her designated representative, shall verify that the geotextile property values meet the manufacturer's specifications, and that the geotextile and installation conforms to the design plans.

5.0 CONSTRUCTION SAMPLING PROGRAM AND TESTING REQUIREMENTS

5.1 General

Sampling and testing requirements for the various materials and activities have been summarized in Table L-1. Frequencies listed in Table L-1 are based on the volume of material used in construction and are to be considered minimums. Frequencies may be increased depending on the actual construction techniques implemented. The CQA Officer, or his/her designated representative, will exercise professional judgment to ensure that testing and sampling fairly represent construction.

5.2 Grade Verification Plan

Following regrading of the existing surface, a registered professional land surveyor will survey the complete surface to certify that actual elevations and grades are in accordance with the engineering plans. Elevations will be surveyed based on the grid points indicated on the Drawings. The documented grades will be included on construction documentation drawings.

5.3 Compacted Low Permeability Soil Sampling Requirements

Testing methods for the compacted low permeability soil liner are referenced in Table L-1. Frequency of testing is based on the volume of material incorporated. The CQA Officer, or his/her designated representative, will choose random test locations throughout the construction area.

5.3.1 Material Thickness Testing

Elevations will be surveyed at the construction control data points indicated on the Drawings for a given surface both before and after cover construction to verify thickness and to verify proper drainage slopes. To obtain the specified design thickness for a given cover layer, additional cover material will be placed and compacted in areas where the as-built thickness is less than the design thickness for the given cover layer.

5.3.2 Moisture/Density Testing

Moisture and density testing by nuclear methods will be conducted at a minimum frequency as stated in Table L-1. The range of moisture content will be determined in accordance with the "acceptable zone" method, which is discussed in Appendix L-1. A moisture test will be considered failed if the result indicates that the moisture content does not lie within the "acceptable zone". Failing material will be dried or wetted until satisfactory moisture content is achieved. A density test will be considered failed if the result indicates a dry density outside the "acceptable zone". The material will be compacted until a passing test is achieved. Increased testing frequency will be required when different soil types are used in cover construction. To ensure accuracy and reproducibility of testing, all density gauges will be certified by annual calibration.

5.3.3 Hydraulic Conductivity Testing

A sample will be obtained and tested for hydraulic conductivity at a minimum frequency as shown in Table L-1. Two samples may be collected at a given test location for the purpose of retesting in

the event of unacceptable hydraulic conductivity results from the initial sample. A test will be considered failed if the results indicate a hydraulic conductivity greater than 1.0×10^{-7} cm/sec. If the test for an area fails, the soil will be removed and/or recompacted and retested until a passing result is obtained.

5.4 Vegetative Cover Soil Layer

The upper surface of the compacted low permeability cover will be dimpled with a soil compactor or some other appropriate means to achieve binding with the overlaying vegetative soil layer. The thickness of the vegetative soil layer shall be documented by comparing the finished elevation of the compacted low permeability soil layer with the final surface elevation. The minimum thickness of the vegetative soil layer will be placed as soon as practicable after placement of the compacted low permeability soil layer.

Finalized area will be prepared and seeded as soon as practicable to prevent erosion and deterioration. The soil sample testing shall be done at a minimum frequency as specified in Table L-1. The CQA Officer, or his/her designated representative, shall review the test results, determine amendments needed, and document application of required soil amendments.

5.5 Gas Management System

Testing methods for the gas management system granular materials are presented in Table L-1. Prior to installation of granular materials and other gas system components, material evaluation tests shall be performed by the supplier or the CQA Officer, or his/her designated representative, to confirm the adequacy of the material from on-site or off-site source areas. The test frequencies will be as specified in Table L-1. The material will be accepted or rejected by the CQA Officer, or his/her designated representative, based on design requirements presented in the design and on the design drawings.

All materials used to construct the gas system will be inspected by the CQA Officer, or his/her designated representative. The inspection will include such characteristics as required to show compliance with the approved plans and specifications. Pipe used in gas system construction will be inspected for proper diameter and material. Granular bedding and backfill for gas system components will be sampled and tested for gradation and hydraulic conductivity at a rate of once per material source, as indicted above and in Table L-1. Gas system components' material that does not conform to manufacturer or design specifications will be repaired or removed and replaced to meet design and manufacturer's specifications.

The CQA Officer, or his/her designated representative, shall observe and document installation of the gas system, including excavation of trenches, pipe system installation, and granular material placement, for conformance with the design, design drawings, and manufacturer's recommendations. The CQA Officer, or his/her designated representative, shall observe and ensure placement of general backfill is performed in such a manner that damage to gas system components does not occur.

5.6 Geotextile

Incoming rolls of the geotextiles shall be inventoried and inspected by the CQA Officer, or his/her designated representative, as they are unloaded. Holes, tears, or other visible defects shall be clearly marked on the geotextiles for identification of necessary repairs. The CQA Officer, or his/her designated representative, shall observe and document geotextile placement such that installation is performed in conformance with the design, design drawings, and manufacturer's recommendations.

TABLE L-1

MATERIAL TESTING AND FREQUENCY

PRECONSTRUCTION / PREQUALIFICATION TESTING			
Material	**Test**	**Requirement**	**Frequency**
Compacted Low Permeability Soil	Particle Size (ASTM D1140)	USCS Classification	1 per 20,000 cy
	Atterberg Limits (ASTM D4318)		
	Classification (ASTM D2487)		
	Hydraulic Conductivity	1×10^{-7} cm/sec	
	Standard Proctor (ASTM D-698)	Verify Soil Characteristics	
	Develop Acceptable Zone	Verify Soil Characteristics	Per Soil Type
Gas System Piping	Material Certification by manufacturer	Design Specifications	1 per Source
	ASTM D- 3350 - For HDPE		
	ASTM D-1784 - For PVC		
Geotextile	Material Certification by manufacturer	Design Specifications	1 per Source
	ASTM D-5261 (mass per unit area)	8 oz/sq yd	1 per Source
Geomembrane	Material Certification by manufacturer	Design Specifications	1 per Source
	ASTM D-5199 (thickness)	40 mils	1 per Source
CONSTRUCTION TESTING			
Material	**Test**	**Requirement**	**Frequency**
Compacted low permeability soil	Field Moisture Content (ASTM D2216 or D3017)	Percent compaction and moisture content within the "Acceptable Zone"	5 per acre per lift
	Field Density (ASTM D2922, D1556, D2937, D2167)	Percent compaction and moisture content within the "Acceptable Zone"	
	Density (Sand cone, Balloon Test, or Drive Cylinder)	Check Nuclear Gauge	1 per week of construction
	Standard Proctor (ASTM D-698)	Verify Soil Characteristics	1 per 10,000 cy
	Hydraulic Conductivity (ASTM D5084)	1×10^{-7} cm/sec	
	Thickness *	Design Thickness	Grid Points on Drawings
Vegetative Soil	pH (ASTM D-4972)	Verify Soil Characteristics	1 per source
	Organic Content (ASTM D-2974)		
	Thickness *	Design Thickness	Grid Points on Drawings
Gas System Granular Material	Particle Size (ASTM D1140, D422)	Design Specifications	1 per source
	Hydraulic Conductivity (ASTM D2434)	Verify Soil Characteristics	

* Thickness can be checked by surveying or other method acceptable to the certifying engineer.

6.0 DOCUMENTATION

6.1 General

The CQA Officer will be responsible for the overall administration and control of the project construction observation documents.

Construction observation, documentation, drawings, and acceptance reports for all components associated with construction of the landfill will be included as part of construction documentation reports for the landfill.

6.2 Daily Summary Reports

Each day of construction will be documented by a daily summary report. The report will be prepared by the CQA Officer or his designated representative and contain the following information:

1. Date
2. Summary of weather conditions.
3. Summary of locations where construction is occurring.
4. Equipment and personnel on the project.
5. Summary of any meetings held and attendees.
6. Description of all materials used and references or results of testing and documentation.
7. Calibration and recalibration of test equipment.
8. Daily inspection summaries from each inspector, including:
    - Summary of locations where construction is occurring.
    - Type of Inspection.
    - Inspection procedure used.
    - Test data.
    - Results of the activity.
    - Personnel involved in the inspection and sampling activities.
    - Signature of inspector.
    - Photographic records as appropriate.

6.3 Photographic Documentation

Construction documentation may be recorded with photographs, as appropriate. Photographs may be utilized to document construction observation activities, project progress, and work acceptability. Any photographs will be maintained by the CQA Officer. All CQA personnel will be required to identify the following information for each photograph recorded:

1. Location of work, date and time.
2. The name and signature of the photographer.
3. Description of activity.

6.4 Acceptance Reports

Upon completion of the work or of a major phase of the work, the CQA Officer shall submit an acceptance report. The report shall summarize the activities of the project and document all aspects of the quality assurance program that were performed in accordance with the requirements of the CQA plan. The CQA Officer shall state in the report that the installation has proceeded in accordance with the CQA Program. At a minimum, the report shall contain the following:

1. A certification by the CQA Officer that the construction has been prepared and constructed in accordance with the engineering design;
2. Record drawings;
3. All daily summary reports;
4. Documentation forms; and
5. Photographic logs.

APPENDIX L-1

PROCEDURE FOR DETERMINATION OF ACCEPTABLE ZONE FOR SOIL AND MOISTURE CONTENT

1.0 INTRODUCTION

One important factor affecting the performance of compacted soil cover liner is adequate control of water content and dry unit weight during construction. Because a cover is meant to be a hydraulic barrier, hydraulic conductivity requirements are the primary factor affecting the criteria of compaction specification.

For soil construction work, a typical requirement will be that the soil be placed at 90% Standard Proctor dry density (ASTM D698) with a moisture content of optimum to 5 points wet of optimum. But for Supply Side Landfill final cover construction, the governing specification for placement will be testing of the cover liner soils to determine its acceptable zone for a maximum hydraulic conductivity of $1.0x10^{-7}$ cm/sec. Research work performed by Benson and Daniel (1990) indicates that the acceptable zone can be expected to parallel a "line of optimums". This procedure should be performed when a new source of soil is selected for liner construction or when the Standard Proctor density changes by 10 pounds per cubic foot or more.

2.0 PROCEDURE

The following steps will be performed during prequalification of a soil source for liner construction. Prequalification also includes the performance of soil index testing. Such as Grain Size distribution analysis and Atterberg limits, and the determination of Standard Proctor densities. Once the testing is completed, the following steps will be followed to establish the acceptable zone.

Compact three soils samples at a controlled moisture content of ± 1 point of optimum moisture at approximately 95, 90 and 85 % maximum dry density. These samples should be tested for hydraulic conductivity using ASTM D5084. If all samples pass, it can be assumed as conformation that 90 % is an appropriate lower density.

If all three initial hydraulic conductivity test results are $> 1.0x10^{-7}$ cm/sec, then three more samples should be prepared to confirm the moisture content range. Using approximately 85 to 87% dry density, prepare one sample at –2 points (dry of optimum), one +3 points and one at +8 points of optimum. These samples should then be tested for hydraulic conductivity using ASTM D 5084. If all sample pass, it can be assumed as confirmation that optimum to +5 points is an appropriate moisture content range.

If the first two steps do not confirm the hydraulic conductivity window, then CQA Officer will determine if the soil will be used for construction. If it will be used, then further testing will be performed to define a smaller acceptable zone. A smaller zone will significantly increase the construction effort and material testing.

In some cases, soil borrow sources may be so variable that composting of the soil will be required

for testing. In these cases, 3 or 4 Standard Proctor tests should be performed to determine the range of maximum dry density. If the range of dry densities is less than 10 pcf a composite can be tested as outlined above. If the range of maximum dry densities is greater the highest and lowest soil values should be tested to determine an acceptable range. Selection of density values will be based upon identification of soil percentages. Prequalification testing will assure the conformance by hydraulic conductivity.

3.0 USE OF ACCEPTABLE ZONE

During construction, the acceptable zone will be verified by the specified frequency of construction soil sampling. Each sample obtained (1 per 10,000 cubic yards of soil placed) will be tested for Standard Proctor density, grain size, Atterberg limits and hydraulic conductivity testing. The results can than be compared to the prequalification testing to verify soil consistency and passing hydraulic conductivity. These tests can also be plotted on the Standard Proctor as documentation of the acceptable zone of as demonstration that the zone can be enlarged.

4.0 REFERENCES

Daniel, D.E and C.H. Benson (1990), " Water Content-Density Criteria for Compacted Soil Liners, " *Journal of Geotechnical Engineering*, American Society of Civil Engineers, New York, Vol 116, No. 12, pp 1181-1830.

APPENDIX M

ENGINEER'S COST ESTIMATE

Table M-1
Engineering Cost Estimate
Supply Side Landfill
Naval Station Great Lakes
Great Lakes, IL
(NSGL Supplies Soil)

Description	Location	Estimated Quantity	Unit	Unit Price	Estimated Cost	Remark
Site Preparation						
Construction Mobil/Demobilization				LS	$35,870	4% of Total
Clearing and Grubbing	On Landfill	7.5	acres	$2,975.00	$22,313	
Existing Gas Vent Removal	On Landfill	30.0	ea	$100.00	$3,000	
Regrading existing surface (Cut Volume) *	On Landfill	34,500	cy	$2.70	$93,150	
Regrading existing surface (Fill Volume) *	On Landfill	31,000	cy	$0.60	$18,600	
Smooth Drum Rolling	On Landfill	72,600	sy	$0.15	$10,890	
Extend Existing Monitoring Wells	On Landfill	3	ea	$1,000.00	$3,000	
Miscellaneous Soil, Hauling	Borrow source/on landfill	5,500	cy	$2.86	$15,730	Panhandle Area
Miscellaneous Soil, Spreading	On Landfill	5,500	cy	$1.32	$7,260	Panhandle Area
Fence (Removal & Replacement)	On Landfill	1,600	lf	$25.00	$40,000	
Landfill Gas Collection System						
Trench Wellhead Assembly	Gas Collection Trench	7	ea.	$800.00	$5,600	
Trench Riser 6"sch 80 PVC Pipe Installed	Gas Collection Trench	50	ft	$10.00	$500	
Trench Bore Hole Installation	Gas Collection Trench	678	ft	$65.00	$44,070	
6" Diameter (Material)	Gas Collection Trench	2,970	ft	$3.00	$8,910	
18" Diameter Trench (Installation)	Gas Collection Trench	2,970	ft	$36.40	$108,108	
HDPE Fittings(Material)	Gas Collection Trench			LS	$3,228	
HDPE Liner(Material & Installation)	Gas Collection Trench	4,000	sf	$0.84	$3,360	
Header Access Riser (Material & Installation)	Gas Collection Trench	14	ea.	$1,000.00	$14,000	
CMP Casing	Gas Collection Trench	260	ft	$15.00	$3,900	
Route Survey				LS	$2,500	
Final Cover System						
Compacted Clay, Hauling 12CY/1/4M	Borrow source/on landfill	35,500	cy	$2.86	$101,530	12 cy per load
Compacted Clay(8"), Spreading	On Landfill	35,500	cy	$1.32	$46,860	Spread by Dozer
Compacted Clay, Compacting	On Landfill	35,500	cy	$0.49	$17,395	Sheep Foot, 6" lift, 2 pass
Vegetative Topsoil (6"), Loading	Borrow source/on landfill	12,000	cy	$1.30	$15,600	Front End Loader - Load Trucks
Vegetative Topsoil (6"), 12CY/1/4M, Hauling	Borrow source/on landfill	12,000	cy	$2.86	$34,320	Dump Truck-To Landfill
Vegetative Top Soil, Spreading	On Landfill	12,000	cy	$1.32	$15,840	Spread by Dozer
Silt Fencing	On Landfill	4,000	lf	$0.93	$3,720	
Top Soil, Tilling 4" Deep	On Landfill	653	MSF	$1.49	$974	
Seeding, Mulch and Fertilizer (hydro)	On Landfill	653	MSF	$53.00	$34,630	
Road Surfaces						
Geotextile	Purchased & Installed	25,000	sf	$0.17	$4,250	
Coarse Aggregate	Purchased	933	cy	$12.83	$11,970	@$9.50/ton
Coarse Aggregate, 12" Depth, Spreading	On Landfill	2,800	sy	$5.60	$15,680	
Documentation						
QA/QC				LS	$45,000	approx 5 % of overall estimate
Surveys (3 @ $5000)	On Landfill			LS	$15,000	
Contingency 10%					$90,000	
				Total	**$896,758**	

Notes:

* Assumes that regrading is accomplished with scrapers transporting material from cut areas to fill areas.

1) Estimates are based on RS Means
2) No purchase of various soils is included in the estimate. It has been assumed that the required soils will be made available and stockpiled on-site.

Table M-2
Engineering Cost Estimate
Supply Side Landfill
Naval Station Great Lakes
Great Lakes, IL
(NSGL Purchases Soil)

Description	Location	Estimated Quantity	Unit	Unit Price	Estimated Cost	Remark
Site Preparation						
Construction Mobil/Demobilization				LS	$56,620	4% of Total
Clearing and Grubbing	On Landfill	7.5	acres	$2,975.00	$22,313	
Existing Gas Vent Removal	On Landfill	30.0	ea	$100.00	$3,000	
Regrading existing surface (Cut Volume) *	On Landfill	34,500	cy	$2.70	$93,150	
Regrading existing surface (Fill Volume) *	On Landfill	31,000	cy	$0.60	$18,600	
Smooth Drum Rolling	On Landfill	72,600	sy	$0.15	$10,890	
Extend Existing Monitoring Wells	On Landfill	3	ea	$1,000.00	$3,000	
Misc Soil, Purchase and Delivery	Purchased/Delivered	2,000	cy	$8.00	$16,000	Panhandle Area
Miscellaneous Soil, Hauling	Borrow source/on landfill	5,500	cy	$2.86	$15,730	Panhandle Area
Miscellaneous Soil, Spreading	On Landfill	5,500	cy	$1.32	$7,260	Panhandle Area
Fence (Removal & Replacement)	On Landfill	1,600	lf	$25.00	$40,000	
Landfill Gas Collection System						
Trench Wellhead Assembly	Gas Collection Trench	7	ea.	$800.00	$5,600	
Trench Riser 6"sch 80 PVC Pipe Installed	Gas Collection Trench	50	ft	$10.00	$500	
Trench Bore Hole Installation	Gas Collection Trench	678	ft	$65.00	$44,070	
6" Diameter (Material)	Gas Collection Trench	2,970	ft	$3.00	$8,910	
18" Diameter Trench (Installation)	Gas Collection Trench	2,970	ft	$36.40	$108,108	
HDPE Fittings(Material)	Gas Collection Trench			LS	$3,228	
HDPE Liner(Material & Installation)	Gas Collection Trench	4,000	sf	$0.84	$3,360	
Header Access Riser (Material & Installation)	Gas Collection Trench	14	ea.	$1,000.00	$14,000	
CMP Casing	Gas Collection Trench	260	ft	$15.00	$3,900	
Route Survey				LS	$2,500	
Final Cover System						
Compacted Clay, Purchase and Delivery	Purchased/Delivered	35,500	cy	$8.00	$284,000	
Compacted Clay, Hauling 12CY/1/4M	Borrow source/on landfill	35,500	cy	$2.86	$101,530	12 cy per load
Compacted Clay(8"), Spreading	On Landfill	35,500	cy	$1.32	$46,860	Spread by Dozer
Compacted Clay, Compacting	On Landfill	35,500	cy	$0.49	$17,395	Sheep Foot, 6" lift, 2 pass
Topsoil, Purchase and Delivery	Purchased/Delivered	12,000	cy	$10.00	$120,000	
Vegetative Topsoil (6"), Loading	Borrow source/on landfill	12,000	cy	$1.30	$15,600	Front End Loader - Load Trucks
Vegetative Topsoil (6"), 12CY/1/4M, Hauling	Borrow source/on landfill	12,000	cy	$2.86	$34,320	Dump Truck-To Landfill
Vegetative Top Soil, Spreading	On Landfill	12,000	cy	$1.32	$15,840	Spread by Dozer
Silt Fencing	On Landfill	4,000	lf	$0.93	$3,720	
Top Soil, Tilling 4" Deep	On Landfill	653	MSF	$1.49	$974	
Seeding, Mulch and Fertilizer (hydro)	On Landfill	653	MSF	$53.00	$34,630	
Road Surfaces						
Geotextile	Purchased & Installed	25,000	sf	$0.17	$4,250	
Coarse Aggregate	Purchased	933	cy	$12.83	$11,970	@$9.50/ton
Coarse Aggregate, 12" Depth, Spreading	On Landfill	2,800	sy	$5.60	$15,680	
Documentation						
QA/QC				LS	$71,000	approx 5 % of overall estimate
Surveys (3 @ $5000)	On Landfill			LS	$15,000	
Contingency 10%					$142,000	
				Total	**$1,415,508**	

Notes:

* Assumes that regrading is accomplished with scrapers transporting material from cut areas to fill areas.

1) Estimates are based on RS Means
2) Purchase of the various required soils is included in the estimate, purchased and delivered to site.

APPENDIX N

CONSTRUCTION SCHEDULE

Construction Schedule
Supply Side Landfill
Naval Station Great Lakes
Great Lakes, IL